FINAL ADDENDUM II

Intrinsic Remediation
Engineering Evaluation/Cost Analysis
for the FT-002 Site

Plattsburgh Air Force Base
New York

Prepared For

Air Force Center for Environmental Excellence
Technology Transfer Division
Brooks Air Force Base
San Antonio, Texas

and
Plattsburgh Air Force Base
New York

October 1999

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ENGINEERING EVALUATION/COST ANALYSIS
FOR THE FT-002 SITE

at

PLATTSBURGH AIR FORCE BASE
NEW YORK

October 1999

Prepared for:

AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
TECHNOLOGY TRANSFER DIVISION
BROOKS AIR FORCE BASE
SAN ANTONIO, TEXAS

and

PLATTSBURGH AIR FORCE BASE
NEW YORK

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAH	chlorinated aliphatic hydrocarbon
1,1-DCE	1,1-dichloroethene
cis-1,2-DCE	*cis*-1,2-dichloroethene
DO	dissolved oxygen
EE/CA	Engineering Evaluation/Cost Analysis
ft/ft	foot/foot
LTM	long-term monitoring
µg/L	micrograms per liter
mg/L	milligrams per liter
MTBE	methyl tertiary-butyl ether
mV	millivolts
NRMRL	National Risk Management Research Laboratory
OHM	OHM Remediation Service Corporation
ORP	oxidation-reduction potential
Parsons ES	Parsons Engineering Science, Inc.
PCE	tetrachloroethene
redox	oxidation-reduction
TCE	trichloroethene
TMB	trimethylbenzene
TOC	total organic carbon
trans-1,2-DCE	*trans*-1,2-dichloroethene
USEPA	US Environmental Protection Agency
VC	vinyl chloride

FINAL ADDENDUM II

INTRINSIC REMEDIATION ENGINEERING EVALUATION/COST ANALYSIS FOR THE FT-002 SITE

1.0 INTRODUCTION

This report was prepared for the Air Force Center for Environmental Excellence (AFCEE) by Parsons Engineering Science, Inc. (Parsons ES) as a second addendum (Addendum II) to the *Final Intrinsic Remediation Engineering Evaluation/Cost Analysis* (EE/CA) (Parsons ES, 1995). The EE/CA was conducted to evaluate the use of natural attenuation with long-term monitoring (LTM) for remediation of fuel hydrocarbons dissolved in groundwater at site FT-002, Plattsburgh Air Force Base (AFB), New York. The report also provided an assessment of the concentration and distribution of chlorinated aliphatic hydrocarbons (CAHs) dissolved in groundwater.

The EE/CA was based on sampling data collected during December 1993, and the first addendum (Parsons ES, 1997) reported sampling data from August 1995 and May 1996. This second addendum summarizes the results of a subsequent sampling event performed in November 1998 by researchers from the US Environmental Protection Agency (USEPA) National Risk Management Research Laboratory (NRMRL), Subsurface Protection and Remediation Division. The main emphasis of this summary is to evaluate changes in the magnitude and extent of dissolved benzene, toluene, ethylbenzene, and xylenes (BTEX) and CAHs in groundwater, and in the dominant natural attenuation mechanisms. Comparison of the 1998 data with results, calculations, and predictions presented in the EE/CA and the first addendum provides the basis for this evaluation.

Former fire protection training Site FT-002, formerly designated FT-001, is located in the northwest corner of the Base and encompasses an area approximately 700 feet wide and 800 feet long. The site is located approximately equidistant (500 feet) between the Plattsburgh AFB runway on the east and the Base boundary on the west. The source of contamination at Site FT-002 is most likely unburned fuels and waste solvents released during fire training exercises that occurred from the mid-1950s until 1989. To date, remediation at Site FT-002 has consisted primarily of LNAPL recovery and bioventing with soil vapor extraction (SVE), using systems installed in each of four former fire training pits. Additional site information, including site background, geology, and hydrogeology is provided in the EE/CA (Parsons ES, 1995).

2.0 RESULTS

In November 1998, researchers from the USEPA NRMRL measured groundwater levels at 11 monitoring wells/points, and collected groundwater samples from 15 monitoring wells/points at Site FT-002. Samples were analyzed in the field for oxidation-reduction potential (ORP), dissolved oxygen (DO), temperature, pH,

conductivity, alkalinity, sulfide, and ferrous iron. Additional sample volumes were analyzed at the USEPA NRMRL in Ada, Oklahoma for BTEX, trimethylbenzenes (TMBs), methyl tertiary-butyl ether (MTBE), total fuel carbon, CAHs, chlorobenzenes, ammonia, nitrate + nitrite, sulfate, chloride, methane, ethane, ethene, and total organic carbon (TOC). Analytical methods for November 1998 are summarized in Table 1.

2.1 Groundwater Flow Direction and Gradient

Groundwater elevation data are summarized in Table 2, and groundwater elevations for May 1995 and November 1998 are contoured on Figure 1. In November 1998, groundwater in the vicinity of Site FT-002 was inferred to flow toward the southeast, at a gradient of approximately 0.01 foot per foot (ft/ft). Downgradient from the source area, the flow direction changes toward the south-southeast, parallel to the flightline and toward a swale that intermittently contains surface water. The groundwater elevations, gradients, and flow directions measured in November 1998 are similar to those observed in December 1993 and May 1995, as described in the EE/CA and the first addendum (Parsons ES, 1995 and 1997).

2.2 Dissolved BTEX Contamination

BTEX compounds were detected in groundwater samples from 9 of the 15 monitoring wells/points sampled in November 1998. A summary of analytical results for BTEX, total fuel carbon, TMBs, and MTBE is contained in Table 3. Concentration isopleth maps for total BTEX in groundwater for December 1993, August 1995, May 1996, and November 1998 are presented on Figure 2.

Temporal and spatial changes in BTEX concentrations indicate that dissolved BTEX concentrations in the source area are decreasing. This is demonstrated by the marked decrease in the total dissolved BTEX concentrations at wells MW-02-005 and MW-02-006 since the original sampling event in December 1993. Both of these wells are located immediately downgradient from the original source area. Samples from monitoring well MW-02-006 have displayed the steadiest decrease in BTEX concentrations. At this location, BTEX concentrations decreased from 1,250 micrograms per liter (µg/L) in December 1993, to 538 µg/L in August 1995, to not detected in November 1998. At well MW-02-005, BTEX concentrations decreased from 154 µg/L in December 1993 to not detected in November 1998. This well was not sampled in August 1995 or May 1996. Approximately 900 feet downgradient from the source area, total BTEX concentrations decreased from 3,060 µg/L in August 1995 to 1,583 µg/L in November 1998 in groundwater samples collected from monitoring well MW-310. The reductions in dissolved BTEX concentrations near the source area are most likely attributable to operation of the bioventing and SVE systems in the fire training pit source areas, and appear to have caused the BTEX plume to detach from the source area.

As depicted on Figure 2, the November 1998 BTEX plume appears to extend further downgradient that the earlier plumes. Comparison of sampling results for downgradient well MW-02-043 for December 1993 and November 1998 suggests that the BTEX plume expanded at least slightly during this period. However, well MW-02-43 was not sampled in 1995 or 1996, which may have affected isopleth construction for

TABLE 1
SUMMARY OF GROUNDWATER ANALYTICAL METHODS
NOVEMBER 1998
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Analyte	Method	Field (F) or Fixed-Base Laboratory (L)
Oxidation-Reduction Potential	Direct Reading Meter	F
Dissolved Oxygen	Direct Reading Meter	F
Conductivity	Direct Reading Meter	F
Temperature	Direct Reading Meter	F
pH	Direct Reading Meter	F
Ferrous Iron (Fe^{2+})	Colorimetric, Hach® Method 8146, or equivalent	F
Sulfide	Colorimetric, Hach® Method 8131, or equivalent	F
Alkalinity (Carbonate [CO_3^{2-}] and Biocarbonate [HCO_3^-])	Titrimetric, Hach® Method 8221, or equivalent	F
Nitrate + Nitrite	Lachat FIA Method 10-107-04-2-A	L
Ammonia	Lachat FIA Method 10-107-06-1-A	L
Chloride	Waters Capillary Electrophoresis Method N-601	L
Sulfate	Waters Capillary Electrophoresis Method N-601	L
Methane, Ethane and Ethene	RSKSOP-175[a/] and RSKSOP-194	L
Total Organic Carbon	RSKSOP-102	L
BTEX, TMBs, MTBE[b/] and Total Fuel Carbon	RSKSOP-133	L
CAHs[c/] and Chlorobenzenes	RSKSOP-148	L

[a/] RSKSOP = Robert S. Kerr Laboratory (now known as NRMRL) standard operating procedure.

[b/] BTEX = Benzene, toluene, ethylbenzene, and xylenes; TMBs = trimethylbenzenes ; MTBE = methyl tertiary-butyl ether.

[c/] CAHs = Chlorinated aliphatic hydrocarbons.

TABLE 2
GROUNDWATER ELEVATION DATA
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Location	Easting	Northing	Date	Datum Elevation (ft amsl)[a/]	Depth to Groundwater (feet below datum)	Groundwater Elevation (ft amsl)
MW-02-005	722393.85	1700306.02	11/98	250.92	NM[b/]	NM
	722393.85	1700306.02	5/95	250.92	34.45	216.47
	722393.85	1700306.02	12/93	250.92	NM	NM
MW-02-006	722521.64	1700372.17	11/98	245.80	28.90	216.90
	722521.64	1700372.17	5/95	245.80	30.18	215.62
	722521.64	1700372.17	12/93	245.80	NM	NM
MW-02-007	722521.41	1700354.16	11/98	248.69	28.60	220.09
	722521.41	1700354.16	5/95	248.69	NM	NM
	722521.41	1700354.16	12/93	248.69	32.40	216.29
MW-02-008	NM	NM	5/95	257.40	40.99	216.41
MW-02-011	NM	NM	5/95	258.32	42.51	215.81
MW-02-014	722146.23	1700554.89	12/93	254.01	NM	NM
MW-02-015	722023.54	1700547.37	5/95	256.25	40.14	216.11
	722023.54	1700547.37	12/93	256.25	40.03	216.22
MW-02-019	722797.86	1700166.45	11/98	227.93	11.50	216.43
	722797.86	1700166.45	5/95	227.93	14.48	213.45
	722797.86	1700166.45	12/93	227.93	14.85	213.08
MW-02-020	722807.69	1700165.37	12/93	230.16	13.15	217.01
MW-02-021	723492.61	1698394.41	11/98	193.85	4.20	189.65
	723492.61	1698394.41	5/95	193.85	4.57	189.28
	723492.61	1698394.41	12/93	193.85	3.99	189.86
MW-02-022	NM	NM	NM	NM	4.20	NM
MW-02-026	721429.01	1700757.23	5/95	274.06	53.73	220.33
	721429.01	1700757.23	12/93	274.06	56.40	217.66
MW-02-027	721430.77	1700751.15	12/93	274.22	53.05	221.17
MW-02-030	722808.70	1700172.70	12/93	229.55	14.60	214.95
MW-02-031	722098.87	1700498.83	5/95	250.81	34.11	216.70
	722098.87	1700498.83	12/93	250.81	33.88	216.93
MW-02-040	724351.63	1699361.02	11/98	209.02	NM	NM
	724351.63	1699361.02	5/95	209.02	9.92	199.10
	724351.63	1699361.02	12/93	209.02	9.40	199.62

TABLE 2 (Continued)
GROUNDWATER ELEVATION DATA
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Location	Easting	Northing	Date	Datum Elevation (ft amsl)[a/]	Depth to Groundwater (feet below datum)	Groundwater Elevation (ft amsl)
MW-02-041	724363.83	1699363.58	11/98	209.05	7.95	201.10
	724363.83	1699363.58	12/93	209.05	8.33	200.72
MW-02-042	724368.43	1699352.83	11/98	208.76	7.22	201.54
	724368.43	1699352.83	12/93	208.76	7.90	200.86
MW-02-043	724953.42	1698070.12	11/98	185.47	2.90	182.57
	724953.42	1698070.12	12/93	185.47	3.45	182.02
MW-02-044	725474.64	1697178.35	12/93	190.21	7.62	182.59
MW-04-005	NM	NM	5/95	190.96	2.32	188.64
MW310	NM	NM	11/98	NM	10.50	NM
MW336	NM	NM	11/98	NM	9.90	NM
44-PLT-W1	NM	NM	11/98	NM	6.20	NM
45-PLT-W1	NM	NM	11/98	NM	6.10	NM
84B	722267.00	1700360.00	12/93	241.52	25.50	216.02
84E	722437.00	1700360.00	12/93	241.52	28.00	213.52
84F	722437.00	1700360.00	12/93	244.26	28.50	215.76
84M	722502.00	1700270.00	12/93	243.40	29.00	214.40
84O	722723.00	1700310.00	12/93	234.10	21.60	212.50

[a/] ft amsl = feet above mean sea level.

[b/] NM = not measured.

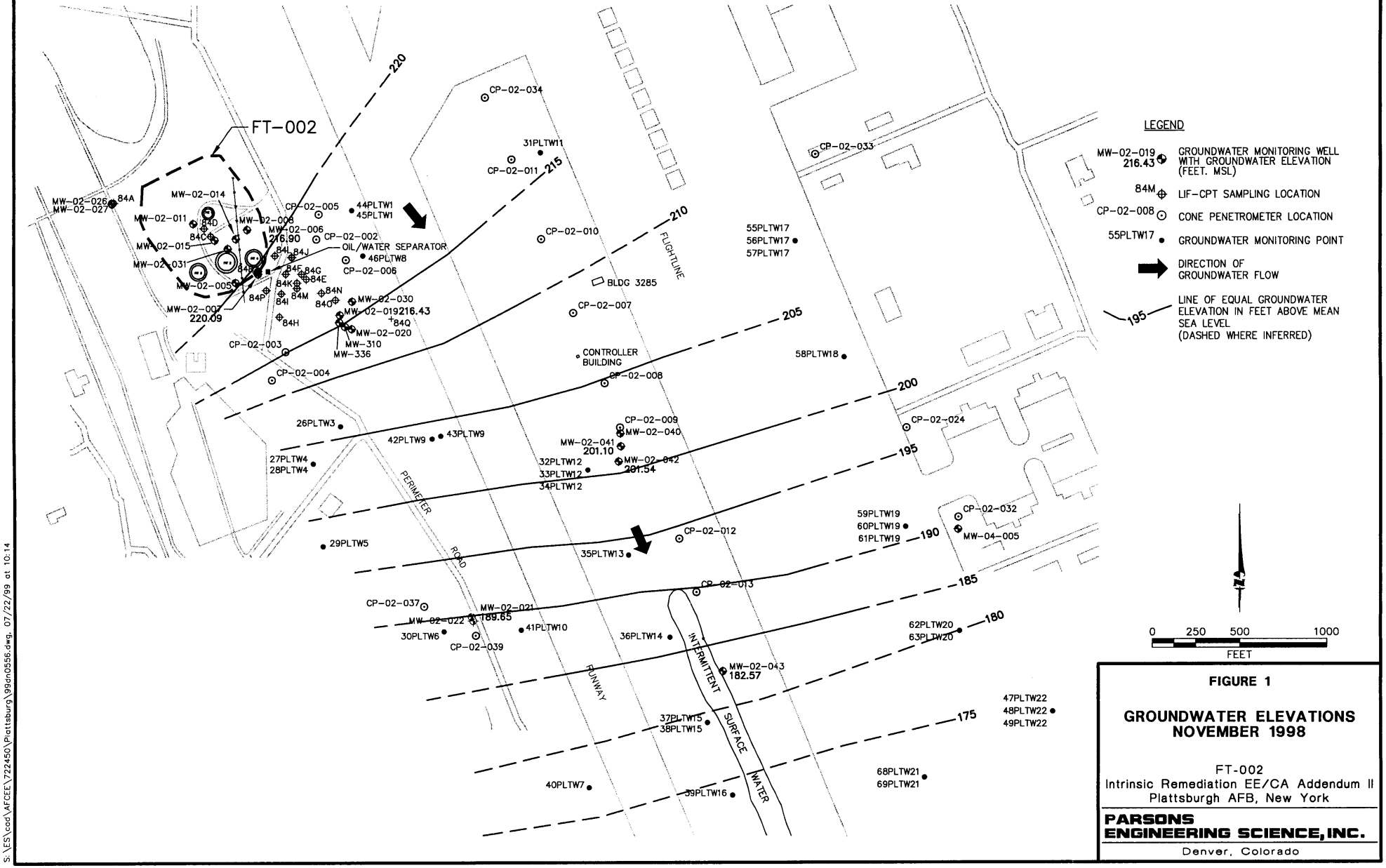

FIGURE 1

GROUNDWATER ELEVATIONS NOVEMBER 1998

FT-002
Intrinsic Remediation EE/CA Addendum II
Plattsburgh AFB, New York

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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TABLE 3
SUMMARY OF FUEL HYDROCARBONS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Total Fuel Carbon (µg/L)[b/]	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	p-xylene (µg/L)	m-xylene (µg/L)	o-xylene (µg/L)	Total Xylenes (µg/L)	Total BTEX[a/] (µg/L)	1,3,5-TMB[a/] (µg/L)	1,2,4-TMB (µg/L)	1,2,3-TMB (µg/L)	MTBE[a/] (µg/L)
MW-02-005	11/98	ND[c/]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/93	844	1.27	< 0.5	107	37.1	7.69	1.27	46.1	154	2.57	5.48	7.65	NA[d/]
MW-02-006	11/98	ND	ND	ND	ND	ND	BLQ[e/]	ND	ND	ND	ND	ND	ND	ND
	8/95	NA	2.7	35	179	82.8	165	73.4	321	538	38.6	101	50.3	NA
	12/93	3,820	7.32	101	144	200	515	283	998	1,250	180	588	306	NA
MW-02-007	11/98	ND	ND	ND	ND	ND	BLQ	ND	ND	ND	ND	ND	ND	ND
	12/93	BLQ	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NA
MW-02-014	12/93	9,940	342	1,560	808	795	1,790	715	3,300	6,010	111	352	189	NA
MW-02-015	12/93	2,800	30.2	303	161	183	512	213	908	1,400	93	255	145	NA
MW-02-017	11/98	12.4	ND	ND	2.2	2	3.7	ND	5.7	7.9	ND	ND	ND	ND
MW-02-019	11/98	6,330	170	255	577	550	1,080	414	2,040	3,050	202	515	198	BLQ
	5/96	NA	115	107	303	214	164	75.8	454	979	39.8	111	62.2	NA
	8/95	NA	148	109	338	156	178	93	427	1,020	45	111	66.3	NA
	12/93	4,410	321	327	433	352	703	263	1,320	2,400	65.9	179	93.2	NA
MW-02-020	12/93	7,560	286	148	563	534	1,190	419	2,140	3,140	116	322	157	NA
MW-02-021	11/98	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/93	BLQ	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NA
MW-02-022	11/98	71	1.1	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	2.5
MW-02-026	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
	12/93	25.7	< 0.5	< 0.5	< 0.5	< 0.5	3.69	2.55	6.24	6.24	1.19	1.96	1.66	NA
MW-02-027	12/93	BLQ	< 0.5	< 0.5	< 0.5	< 0.5	0.997	< 0.5	0.997	0.997	< 0.5	< 0.5	< 0.5	NA
MW-02-030	12/93	145	16.5	1.06	19.9	3	4.72	1.48	9.2	46.7	< 0.5	1.1	< 0.5	NA
MW-02-040	11/98	95.6	2.7	ND	ND	ND	ND	ND	ND	2.7	1.3	ND	ND	BLQ
	5/96	NA	2.3	ND	ND	ND	ND	ND	ND	2.3	ND	1.4	ND	NA
	8/95	NA	2.8	ND	ND	ND	ND	ND	ND	2.8	< 1.0	ND	ND	NA
	12/93	92	1.93	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.93	< 0.5	< 0.5	< 0.5	NA

TABLE 3 (Continued)
SUMMARY OF FUEL HYDROCARBONS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Total Fuel Carbon (µg/L)[b/]	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	p-xylene (µg/L)	m-xylene (µg/L)	o-xylene (µg/L)	Total Xylenes (µg/L)	Total BTEX[a/] (µg/L)	1,3,5-TMB[a/] (µg/L)	1,2,4-TMB (µg/L)	1,2,3-TMB (µg/L)	MTBE[a/] (µg/L)
MW-02-041	11/98	594	36.3	ND	ND	ND	0.6	ND	0.6	36.9	4.2	0.9	ND	BLQ
	5/96	NA	11.7	ND	ND	ND	ND	ND	ND	11.7	ND	ND	ND	NA
	8/95	NA	17.6	< 1.0	ND	ND	ND	ND	ND	17.6	< 1.0	ND	< 1.0	NA
	12/93	1,850	40.7	< 0.5	< 0.5	< 0.5	< 0.5	0.914	0.914	41.6	< 0.5	< 0.5	< 0.5	NA
MW-02-042	11/98	82.8	66.7	ND	ND	ND	ND	ND	ND	66.7	ND	ND	ND	ND
	5/96	NA	49.1	ND	ND	ND	ND	ND	ND	49.1	ND	ND	ND	NA
	8/95	NA	72	< 1.0	ND	< 1.0	1.0	ND	1.0	73.0	< 1.0	< 1.0	ND	NA
	12/93	469	56.9	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	56.9	< 0.5	< 0.5	< 0.5	NA
MW-02-043	11/98	571	8.1	ND	ND	ND	ND	ND	ND	8.1	ND	ND	ND	ND
	12/93	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NA
MW-02-044	12/93	ND	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NA
MW-108	5/96	NA	261	1,660	896	760	2,230	789	3,780	6,600	132	472	224	NA
	8/95	NA	1,900	6,620	1,540	1,390	3,700	1,640	6,730	16,800	323	949	485	NA
MW-310	11/98	2,810	123	222	383	308	422	125	855	1,580	58.9	168	75.5	2.0
	5/96	NA	512	1,200	564	469	1,130	323	1,920	4,200	89	254	120	NA
	8/95	NA	424	678	445	362	871	280	1,510	3,060	116	248	127	NA
MW-336	11/98	48.4	8	ND	6.3	ND	ND	ND	ND	14.3	ND	ND	ND	ND
	5/96	NA	9.2	< 1.0	6.0	ND	ND	ND	ND	15.2	ND	ND	ND	NA
	8/95	NA	20.3	< 1.0	12.5	ND	ND	ND	ND	32.8	ND	ND	ND	NA
25-PLT-W2	8/95	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
26-PLT-W3	8/95	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
27-PLT-W4	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	< 1.0	ND	0.9	NA
28-PLT-W4	8/95	NA	ND	< 1.0	ND	ND	< 1.0	ND	<1.0	<2.0	ND	ND	ND	NA
29-PLT-W5	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
30-PLT-W6	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
31-PLT-W11	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA

TABLE 3 (Continued)
SUMMARY OF FUEL HYDROCARBONS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Total Fuel Carbon (µg/L)[b/]	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	p-xylene (µg/L)	m-xylene (µg/L)	o-xylene (µg/L)	Total Xylenes (µg/L)	Total BTEX[a/] (µg/L)	1,3,5-TMB[a/] (µg/L)	1,2,4-TMB (µg/L)	1,2,3-TMB (µg/L)	MTBE[a/] (µg/L)
32-PLT-W12	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
33-PLT-W12	5/96	NA	3.0	ND	ND	ND	ND	1.1	1.1	4.1	ND	ND	ND	NA
	8/95	NA	12	< 1.0	ND	ND	ND	1.7	1.7	13.7	1.2	ND	ND	NA
34-PLT-W12	5/96	NA	39.8	< 1.0	ND	ND	ND	ND	ND	39.8	ND	ND	ND	NA
	8/95	NA	39.9	< 1.0	ND	ND	ND	ND	ND	39.9	ND	ND	ND	NA
35-PLT-W13	5/96	NA	1.7	ND	ND	ND	ND	ND	ND	1.7	ND	ND	ND	NA
	8/95	NA	2.2	ND	ND	ND	ND	ND	ND	2.2	< 1.0	ND	ND	NA
36-PLT-W14	8/95	NA	2.5	< 1.0	ND	ND	ND	ND	ND	2.5	ND	ND	ND	NA
37-PLT-W15	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
38-PLT-W15	8/95	NA	< 1.0	< 1.0	ND	ND	ND	ND	ND	<2.0	ND	ND	ND	NA
39-PLT-W16	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
40-PLT-W7	8/95	NA	ND	0.9	ND	ND	ND	ND	ND	0.9	ND	ND	ND	NA
41-PLT-W10	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	0.9	0.9	< 1.0	NA
42-PLT-W9	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
43-PLT-W9	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
44-PLT-W1	11/98	ND	ND	ND	BLQ	ND	BLQ	ND	ND	ND	ND	ND	ND	ND
	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	8/95	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
45-PLT-W1	11/98	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
46-PLT-W8	5/96	NA	98.8	7.5	48.8	2.1	ND	2.2	4.3	159	2.9	ND	11.4	NA
	8/95	NA	129	34	62.3	23	ND	14.1	37.1	262	6.7	2.8	13.2	NA
47-PLT-W22	8/95	NA	ND	2.4	< 1.0	< 1.0	1.5	< 1.0	1.5	3.9	ND	ND	ND	NA
49-PLT-W22	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA

TABLE 3 (Continued)
SUMMARY OF FUEL HYDROCARBONS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Total Fuel Carbon (µg/L)[b/]	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	p-xylene (µg/L)	m-xylene (µg/L)	o-xylene (µg/L)	Total Xylenes (µg/L)	Total BTEX[a/] (µg/L)	1,3,5-TMB[a/] (µg/L)	1,2,4-TMB (µg/L)	1,2,3-TMB (µg/L)	MTBE[a/] (µg/L)
55-PLT-W17	8/95	NA	< 1.0	1.3	ND	ND	ND	ND	ND	1.3	ND	ND	ND	NA
56-PLT-W17	8/95	NA	ND	< 1.0	ND	ND	< 1.0	ND	<1.0	<2.0	ND	ND	ND	NA
57-PLT-W17	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
58-PLT-W18	8/95	NA	ND	1.9	ND	ND	1.0	ND	1.0	2.9	ND	ND	ND	NA
59-PLT-W19	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	8/95	NA	ND	1.0	ND	ND	ND	ND	ND	1.0	ND	ND	ND	NA
60-PLT-W19	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	8/95	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
61-PLT-W19	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	< 1.0	ND	ND	NA
63-PLT-W20	5/96	NA	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	NA
	8/95	NA	ND	ND	ND	ND	ND	ND	ND	ND	< 1.0	ND	ND	NA
68-PLT-W21	8/95	NA	ND	3.6	ND	ND	ND	ND	ND	3.6	ND	ND	ND	NA
69-PLT-W21	8/95	NA	ND	< 1.0	ND	ND	ND	ND	ND	<1.0	ND	ND	ND	NA
84DA	5/96	NA	161	126	326	215	150	64.1	429	1,042	43.2	123	67.4	NA
	8/95	NA	333	380	526	424	858	307	1,590	2,830	96.9	203	104	NA
84DB	5/96	NA	456	1,390	705	571	1,490	568	2,630	5,180	82.2	264	133	NA
	8/95	NA	619	1,640	1,060	1,110	1,930	995	4,040	7,350	193	465	228	NA
84DC	5/96	NA	39.2	22.2	64.1	19.4	2.9	8.1	30.4	156	ND	6.0	14.3	NA
	8/95	NA	10.6	11.3	14.4	5.1	9.4	4.1	18.6	54.9	1.4	2.4	2.3	NA
84DD	5/96	NA	489	845	608	501	1,140	315	1,960	3,900	99.9	280	129	NA
	8/95	NA	435	793	646	478	942	249	1,670	3,540	123	243	122	NA
84DF-22	5/96	NA	2.8	< 1.0	ND	0.9	1.6	1.1	3.6	6.4	ND	1.4	ND	NA
84DF-34	5/96	NA	67.5	14.6	1.1	ND	ND	5.4	5.4	88.6	2.0	ND	6.7	NA
84B (207.22)[f/]	12/93	298	71	52.9	16.2	8.53	24.7	14.9	48.1	188	< 0.5[f/]	2.24	2.46	NA
84B (186.02)	12/93	BLQ	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	NA

TABLE 3 (Continued)
SUMMARY OF FUEL HYDROCARBONS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Total Fuel Carbon (µg/L)[b/]	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	p-xylene (µg/L)	m-xylene (µg/L)	o-xylene (µg/L)	Total Xylenes (µg/L)	Total BTEX[a/] (µg/L)	1,3,5-TMB[a/] (µg/L)	1,2,4-TMB (µg/L)	1,2,3-TMB (µg/L)	MTBE[a/] (µg/L)
84E (210.52)	12/93	3,060	264	525	354	303	671	268	1,240	2,390	54	149	60.6	NA
84E (190.52)	12/93	7,560	448	944	606	553	979	448	1,980	3,980	78.6	227	120	NA
84E (174.52)	12/93	74.3	6.65	< 0.5	7.26	< 0.5	< 0.5	< 0.5	< 0.5	13.9	< 0.5	< 0.5	< 0.5	NA
84F (207.26)	12/93	2570	178	443	263	255	374	249	878	1,760	57.4	159	80.7	NA
84F (197.26)	12/93	3,360	161	363	250	219	461	164	844	1,620	29.7	97.1	49.6	NA
84F (192.26)	12/93	1,930	83.4	107	166	136	226	78.2	440	797	17.3	65.6	33.2	NA
84F (177.26)	12/93	53.1	1.59	< 0.5	11.3	< 0.5	< 0.5	< 0.5	< 0.5	12.9	< 0.5	< 0.5	< 0.5	NA
84M (203.4)	12/93	4,300	183	277	449	480	1,010	352	1,840	2,750	88.6	242	130	NA
84M (183.4)	12/93	124	16.3	1.03	15.7	6.25	< 0.5	< 0.5	< 0.5	39.3	< 0.5	< 0.5	< 0.5	NA
84N (204.15)	12/93	4,620	416	1,090	488	429	902	379	1,710	3,700	70.8	198	99.6	NA
84N (184.15)	12/93	4,200	287	241	318	278	607	223	1,110	1,950	37.8	102	56.8	NA
84O (203.1)	12/93	3,370	298	309	329	294	574	244	1,110	2,050	56.9	149	71.9	NA
84O (188.1)	12/93	3,280	242	78.7	273	233	512	193	938	1,530	32.6	89.9	50	NA

[a/] BTEX = Benzene, toluene, ethylbenzene and xylenes; TMB = trimethylbenzene; MTBE = methyl tertiary-butyl ether.

[b/] µg/L = Micrograms per liter.

[c/] ND = Not Detected.

[d/] NA = Not analyzed.

[e/] BLQ = Below Limit of Quantification.

[f/] Sample collected with cone-penetrometer apparatus at indicated elevation in feet above mean sea level.

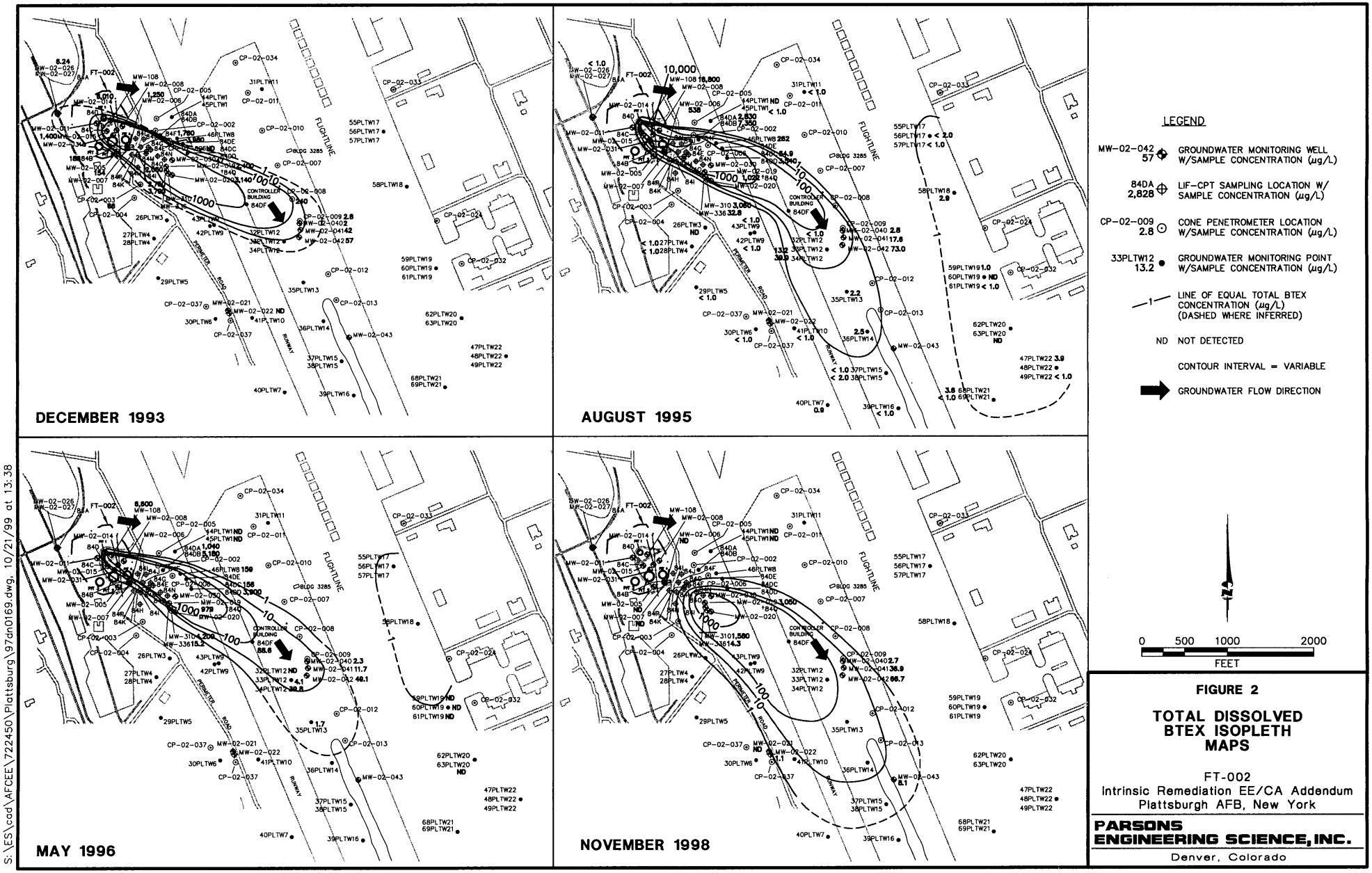

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FIGURE 2

TOTAL DISSOLVED BTEX ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

these sampling events. Data for wells MW-02-040, -041, and -042 suggest that the plume may be at steady-state equilibrium. Continued remediation of the source area should cause the plume to diminish in the future.

Comparisons between the extent of the dissolved BTEX plume between December 1993 and November 1998 and model predictions presented in the EE/CA are inappropriate because predictions were based on a simulated BTEX plume calibrated to the estimated extent of the December 1993 BTEX plume. Subsequent monitoring data suggest that the December 1993 plume likely extended at least 1,200 feet further downgradient than estimated in the EE/CA. Therefore, model predictions of plume migration are probably inaccurate, because the leading edge of the plume was not sufficiently characterized in December 1993. However, the observed decrease in dissolved BTEX concentrations in the source area is consistent with the observation, made in Section 6 of the EE/CA, that attenuation of the BTEX plume can be enhanced by engineered source removal activities.

2.3 Dissolved Chlorinated Solvent Contamination

The CAHs trichloroethene (TCE), *cis*-1,2-dichloroethene (*cis*-1,2-DCE), *trans*-1,2-dichloroethene (*trans*-1,2-DCE), and vinyl chloride (VC) were detected in groundwater samples collected during each of the four sampling events. Tetrachloroethene (PCE) was detected in 1995, 1996, and 1998, but was not targeted for analysis in 1993. Concentrations of CAHs detected in groundwater samples collected since December 1993 are presented in Table 4. The highest CAH concentration in November 1998 was measured at MW-02-043, the sampling location farthest downgradient from the source area.

Concentrations of total CAHs in 6 of the 15 groundwater samples analyzed for CAHs in November 1998 have decreased over time, concentrations of total CAHs in 2 of these samples have increased over time, and CAH levels in 5 samples have remained relatively constant or have fluctuated. The remaining two wells were not sampled prior to November 1998; therefore, temporal trends cannot be discerned. Five of the six wells that showed decreases in total CAH concentrations are located near the original source zone. These wells include MW-02-005, MW-02-006, MW-310, MW-336, and MW-44-PLT-W1. The groundwater sample collected from monitoring well MW-310 in November 1998 showed the largest reduction, to a total CAH concentration of 1,580 µg/L. This represents an 85-percent decrease from the May 1996 total CAH concentration of 10,900 µg/L, and a 90-percent decrease from the August 1995 concentration of 15,900 µg/L.

Four of the five sampled monitoring wells (MW-02-040, MW-02-041, MW-02-042, and MW-02-043) that are located farther downgradient from the original source zone have evidenced increasing or relatively stable total CAH concentrations over time. Monitoring well MW-02-041 evidenced the highest total CAH concentration in November 1998 (4,240 µg/L). Monitoring well MW-02-043 also evidenced a high total CAH concentration in November 1998 (3,000 µg/L), and was the sampling location furthest downgradient from the original source zone. The relatively elevated CAH concentrations at this downgradient well may indicate that a slug of higher CAH concentrations, originating at the fire training area, is migrating southeastward at the

TABLE 4
SUMMARY OF CHLORINATED SOLVENTS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	PCE[a] (µg/L)[e]	TCE[b] (µg/L)	1,1-DCE[c] (µg/L)	*cis*-1,2-DCE (µg/L)	*trans*-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Chlorinated Ethenes (µg/L)	1,3-dichloro-benzene (µg/L)	1,2-dichloro-benzene (µg/L)
MW-02-005	11/98	ND[d]	ND	ND	ND	ND	ND	ND	ND	ND
	12/93	NA[f]	0.6	NA	4.0	<0.5	<0.5	4.6	NA	NA
MW-02-006	11/98	ND	ND	ND	ND	ND	ND	ND	ND	ND
	8/95	ND	< 1.0	ND	23	ND	ND	23	NA	NA
	12/93	NA	0.6	NA	28.7	<0.5	<0.5	29.3	NA	NA
MW-02-007	11/98	ND	ND	ND	ND	ND	ND	ND	ND	ND
	12/93	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	NA
MW-02-014	12/93	NA	1,030	NA	9,050	<0.5	4.5	10,100	NA	NA
MW-02-015	12/93	NA	1,330	NA	110	<0.5	<0.5	1,440	NA	NA
MW-02-017	11/98	2.1	24.9	ND	1.5	ND	ND	28.5	ND	ND
MW-02-19	11/98	ND	19.1	5	1,460	1.9	216	1,700	ND	ND
	5/96	< 1.0	6.7	4.9	63.6	1.2	782	858	ND	2.9
	8/95	ND	< 1.0	<1.0	157	ND	414	571	NA	NA
	12/93	NA	1.9	NA	3,540	<0.5	384	3,930	NA	NA
MW-02-021	11/98	ND	< 1.0	ND	1.2	ND	ND	1.2	<1.0	ND
	12/93	NA	4.6	NA	2	<0.5	<0.5	6.6	NA	NA
MW-02-022	11/98	ND	4.2	ND	8.3	ND	ND	12.5	1.8	<1.0
MW-02-026	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
	12/93	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	NA
MW-02-027	12/93	NA	<0.5	NA	<0.5	<0.5	<0.5	<0.5	NA	NA
MW-02-030	12/93	NA	79.7	NA	185	0.7	<0.5	265	NA	NA
MW-02-040	11/98	ND	2.6	1.2	695	ND	1.8	701	ND	ND
	5/96	ND	2.3	<1.0	543	ND	2.1	547	ND	ND
	8/95	< 1.0	3.4	1	697	ND	2.3	704	NA	NA
	12/93	NA	3.1	NA	339	<0.5	0.8	343	NA	NA

TABLE 4 (Continued)
SUMMARY OF CHLORINATED SOLVENTS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	PCE[a/] (µg/L)[w]	TCE[b/] (µg/L)	1,1-DCE[c/] (µg/L)	*cis*-1,2-DCE (µg/L)	*trans*-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Chlorinated Ethenes (µg/L)	1,3-dichloro-benzene (µg/L)	1,2-dichloro-benzene (µg/L)
MW-02-041	11/98	ND	5.9	7.1	4,230	ND	ND	4,240	ND	<1.0
	5/96	ND	5.6	4.4	2,620	1.3	ND	2,630	ND	ND
	8/95	ND	15.3	7.4	3,950	2.3	ND	3,980	NA	NA
	12/93	NA	30.7	NA	5,230	<0.5	<0.5	5,260	NA	NA
MW-02-042	11/98	ND	21.7	2.7	1,630	6.1	20.1	1,680	ND	ND
	5/96	ND	21.1	2.2	1,040	< 1.0	3.8	1,070	ND	ND
	8/95	ND	61.2	4	1,550	1.2	2.7	1,620	NA	NA
	12/93	NA	98.5	NA	1,570	1.1	2.2	1,670	NA	NA
MW-02-043	11/98	4.1	2,880	1.1	116	ND	ND	3,000	ND	ND
	12/93	NA	373	NA	10.6	<0.5	<0.5	384	NA	NA
MW-108	5/96	< 1.0	562	24.2	12,600	2.3	ND	13,200	1.9	22.4
	8/95	ND	27,200	51.8	51,400	ND	10	78,600	NA	NA
MW-310	11/98	ND	< 1.0	<1.0	445	ND	1,130	1,580	<1.0	4.5
	5/96	ND	1.3	18.8	9,350	7.8	1,520	10,900	ND	9.3
	8/95	ND	2.2	25.6	14,900	13.5	897	15,900	NA	NA
MW-336	11/98	ND	70.4	ND	82.3	1.2	ND	154	ND	ND
	5/96	ND	54	ND	136	< 1.0	1.2	191	ND	ND
	8/95	ND	77.1	<1.0	158	< 1.0	ND	235	NA	NA
25-PLT-W2	8/95	ND	ND	ND	ND	ND	ND[d/]	ND	NA	NA
26-PLT-W3	8/95	ND	1.2	ND	ND	ND	ND	1.2	NA	NA
27-PLT-W4	8/95	ND	ND	ND	< 1.0	ND	1.2	1.2	NA	NA
28-PLT-W4	8/95	ND	1.0	ND	ND	ND	ND	1.0	NA	NA
29-PLT-W5	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
30-PLT-W6	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
31-PLT-W11	8/95	ND	< 1.0	ND	2.3	ND	12.6	14.9	NA	NA

TABLE 4 (Continued)
SUMMARY OF CHLORINATED SOLVENTS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	PCE[a/] (µg/L)[w]	TCE[b/] (µg/L)	1,1-DCE[c/] (µg/L)	*cis*-1,2-DCE (µg/L)	*trans*-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Chlorinated Ethenes (µg/L)	1,3-dichloro-benzene (µg/L)	1,2-dichloro-benzene (µg/L)
32-PLT-W12	5/96	ND	ND	ND	2.8	ND	ND	2.8	ND	ND
	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
33-PLT-W12	5/96	ND	ND	ND	90.3	ND	21.8	112	ND	ND
	8/95	ND	< 1.0	ND	141	ND	246	387	NA	NA
34-PLT-W12	5/96	ND	17.4	2.3	1,880	6.1	12.1	1,920	ND	ND
	8/95	ND	24	3	2,210	5.4	8.3	2,250	NA	NA
35-PLT-W13	5/96	ND	< 1.0	ND	177	< 1.0	3.7	181	ND	ND
	8/95	ND	1.1	<1.0	226	ND	4.9	232	NA	NA
36-PLT-W14	8/95	ND	1.2	ND	115	1.0	1.0	118	NA	NA
37-PLT-W15	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
38-PLT-W15	8/95	ND	ND	ND	24.5	ND	1.6	26.1	NA	NA
39-PLT-W16	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
40-PLT-W7	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
41-PLT-W10	8/95	ND	ND	ND	< 1.0	ND	ND	<1.0	NA	NA
42-PLT-W9	8/95	ND	1.2	ND	7.9	ND	ND	9.1	NA	NA
43-PLT-W9	8/95	ND	1.0	ND	6.8	ND	ND	7.8	NA	NA
44-PLT-W1	11/98	ND	5.6	ND	ND	ND	ND	5.6	ND	ND
	5/96	1.8	130	ND	1.3	ND	ND	133	<1.0	ND
	8/95	2.4	302	<1.0	2.9	ND	ND	307	NA	NA
45-PLT-W1	11/98	<1.0	27.2	ND	ND	ND	ND	27.2	ND	ND
	5/96	ND	5.0	ND	ND	ND	ND	5.0	ND	ND
	8/95	ND	6.8	ND	< 1.0	ND	ND	6.8	NA	NA
46-PLT-W8	5/96	1.5	118	7.8	4,510	3.4	ND	4,640	<1.0	4.8
	8/95	2.8	279	7.6	3,990	2.7	ND	4,280	NA	NA
47-PLT-W22	8/95	ND	2.6	ND	ND	ND	ND	2.6	NA	NA
49-PLT-W22	8/95	ND	3.5	ND	ND	ND	ND	3.5	NA	NA

TABLE 4 (Continued)
SUMMARY OF CHLORINATED SOLVENTS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	PCE[a/] (µg/L)[w]	TCE[b/] (µg/L)	1,1-DCE[c/] (µg/L)	*cis*-1,2-DCE (µg/L)	*trans*-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Chlorinated Ethenes (µg/L)	1,3-dichloro-benzene (µg/L)	1,2-dichloro-benzene (µg/L)
55-PLT-W17	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
56-PLT-W17	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
57-PLT-W17	8/95	ND	1.0	ND	ND	ND	ND	1.0	NA	NA
58-PLT-W18	8/95	ND	12	ND	ND	ND	ND	12.0	NA	NA
59-PLT-W19	5/96	ND	6.6	ND	< 1.0	ND	ND	6.6	ND	ND
	8/95	ND	ND	ND	ND	ND	ND	ND	NA	NA
60-PLT-W19	5/96	ND	2.1	ND	ND	ND	ND	2.1	ND	ND
	8/95	ND	< 1.0	ND	ND	ND	ND	<1.0	NA	NA
61-PLT-W19	5/96	ND	206	ND	4.2	ND	ND	210	ND	ND
	8/95	< 1.0	354	ND	6.7	ND	ND	361	NA	NA
63-PLT-W20	5/96	1.1	700	ND	24.8	ND	ND	726	ND	ND
	8/95	1.2	674	<1.0	23.2	< 1.0	ND	698	NA	NA
68-PLT-W21	8/95	ND	< 1.0	ND	11.6	ND	ND	11.6	NA	NA
69-PLT-W21	8/95	ND	1.3	ND	1.6	ND	ND	2.9	NA	NA
84B (207.22)	12/93	NA	5.6	NA	300	<0.5	<0.5	306	NA	NA
84B (186.02)	12/93	NA	<0.5	NA	3.1	<0.5	<0.5	3.1	NA	NA
84DA	5/96	ND	< 1.0	<1.0	169	ND	387	556	ND	1.6
84D	8/95	ND	1.3	5.2	2,450	6.7	946	3,410	NA	NA
84DB	5/96	ND	< 1.0	7.2	2,830	7.3	1890	4,730	<1.0	12.8
	8/95	ND	< 1.0	11.8	1,800	ND	788	2,600	NA	NA
84DC	5/96	ND	4.8	ND	74.4	ND	146	225	ND	ND
	8/95	ND	9.5	<1.0	94.6	ND	122	226	NA	NA
84DD	5/96	ND	1.4	15.8	10,300	9.0	940	11,300	ND	6.6
	8/95	ND	2.95	19.6	10,000	16.5	1430	11,500	NA	NA
84DF-22	5/96	ND	ND	ND	51.4	ND	91.6	143	ND	ND

TABLE 4 (Continued)
SUMMARY OF CHLORINATED SOLVENTS IN GROUNDWATER
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	PCE[a/] (µg/L)[w]	TCE[b/] (µg/L)	1,1-DCE[c/] (µg/L)	*cis*-1,2-DCE (µg/L)	*trans*-1,2-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Chlorinated Ethenes (µg/L)	1,3-dichloro-benzene (µg/L)	1,2-dichloro-benzene (µg/L)
84DF-34	5/96	ND	ND	1.4	1,420	1.1	524	1,950	ND	ND
84E (210.52)	12/93	NA	<0.5	NA	752	1.2	1020	1,770	NA	NA
84E (190.52)	12/93	NA	0.7	NA	10,000	1.3	25.7	10,000	NA	NA
84E (174.52)	12/93	NA	20.6	NA	160	<0.5	<0.5	181	NA	NA
84F (207.26)	12/93	NA	<0.5	NA	9.1	<0.5	2080	2,090	NA	NA
84F (197.26)	12/93	NA	<0.5	NA	6,370	<0.5	3.6	6,370	NA	NA
84F (192.26)	12/93	NA	0.6	NA	4,310	<0.5	5.7	4,320	NA	NA
84F (177.26)	12/93	NA	12.8	NA	69	<0.5	<0.5	81.8	NA	NA
84M (203.4)	12/93	NA	<0.5	NA	1,320	<0.5	1050	2,370	NA	NA
84M (183.4)	12/93	NA	9.1	NA	240	<0.5	<0.5	249	NA	NA
84N (204.15)	12/93	NA	<0.5	NA	208	<0.5	1710	1,920	NA	NA
84N (184.15)	12/93	NA	<0.5	NA	5,850	1	3.1	5,850	NA	NA
84O (203.1)	12/93	NA	2.8	NA	3,140	<0.5	486	3,630	NA	NA
84O (188.1)	12/93	NA	<0.5	NA	6,710	<0.5	<0.5	6,710	NA	NA
PTAN SEWER	8/95	ND	41.3	ND	2.4	ND	ND	43.7	NA	NA

[a/] PCE = Tetrachloroethene.

[b/] TCE = Trichloroethene.

[c/] DCE = Dichloroethene.

[d/] µg/L = Micrograms per liter.

[e/] ND = Not detected.

[f/] NA = Not analyzed.

site. Alternatively, this concentration may be a result of a second CAH plume from another source located east of Site FT-002 converging with the FT-002 plume. This theory of converging CAH plumes was originally suggested in the 1995 addendum (Parsons ES, 1997).

Isopleth maps of TCE concentrations detected in groundwater in December 1993, August 1995, May 1996, and November 1998 are presented on Figure 3. Downgradient from the Site FT-002 source area, the TCE plume appears to converge with a second plume originating from an unknown source located east of the flightline. Data collected during the May 1996 sampling event and the ramp survey (OHM Remediation Service Corporation [OHM], 1996) confirm that an alternate source of CAHs, unrelated to Site FT-002, exists on the eastern side of the flightline in the area characterized by monitoring wells 47-PLT-W22 through 69-PLT-W21. Results of the ramp survey (OHM, 1996) also suggest that CAH contamination extends farther downgradient along the flightline, beyond the area of study addressed in this addendum.

cis-1,2-DCE was the CAH detected at the highest concentrations at most locations during all of the sampling events (Figure 4). During the December 1993, August 1995, and May 1996 sampling events, the total CAH concentrations were composed of an average of approximately 86 to 87 percent cis-1,2-DCE, 9 to 10 percent VC, 3 to 4 percent TCE, and less than 1 percent PCE and trans-1,2-DCE. Isopleth maps for VC are presented on Figure 5. The consistency of the average chlorinated solvent ratios from 1993 through 1996 suggests that the CAH plume had reached steady-state equilibrium, and that degradation rates for the individual chlorinated compounds have remained relatively constant through time. Alternatively, the consistent CAH ratios may indicate that biodegradation of CAHs had slowed and little additional degradation was occurring.

Total CAH concentrations measured in groundwater samples collected during the November 1998 sampling event averaged approximately 53 percent *cis*-1,2-DCE, 42 percent TCE, 7 percent VC, and less than 1 percent PCE and *trans*-1,2-DCE. However, the percentage differences between the 1998 and prior sampling events are due in part to the inclusion of data from well MW-02-43 in the 1998 calculations. This downgradient well also was sampled in December 1993, but not in 1995 or 1996. Comparison of the total CAH concentrations detected in groundwater from this well in 1993 (384 µg/L) and 1998 (3,000 µg/L) indicate that the plume expanded toward the southeast during this time period. The available data are insufficient to determine whether the CAH plume was still expanding in 1998. However, data for wells MW-02-040, -041, and -042 suggest that the Site FT-002 component of the CAH plume may be at or approaching steady state.

2.4 Biodegradation of BTEX

As discussed in the EE/CA, microorganisms obtain energy for cell production and maintenance by facilitating thermodynamically advantageous reduction/oxidation (redox) reactions involving the transfer of electrons from electron donors to available electron acceptors. This results in the oxidation of the electron donor and the reduction of the electron acceptor. Electron donors in Site FT-002 groundwater include natural organic carbon, fuel hydrocarbon compounds, and the less chlorinated ethenes

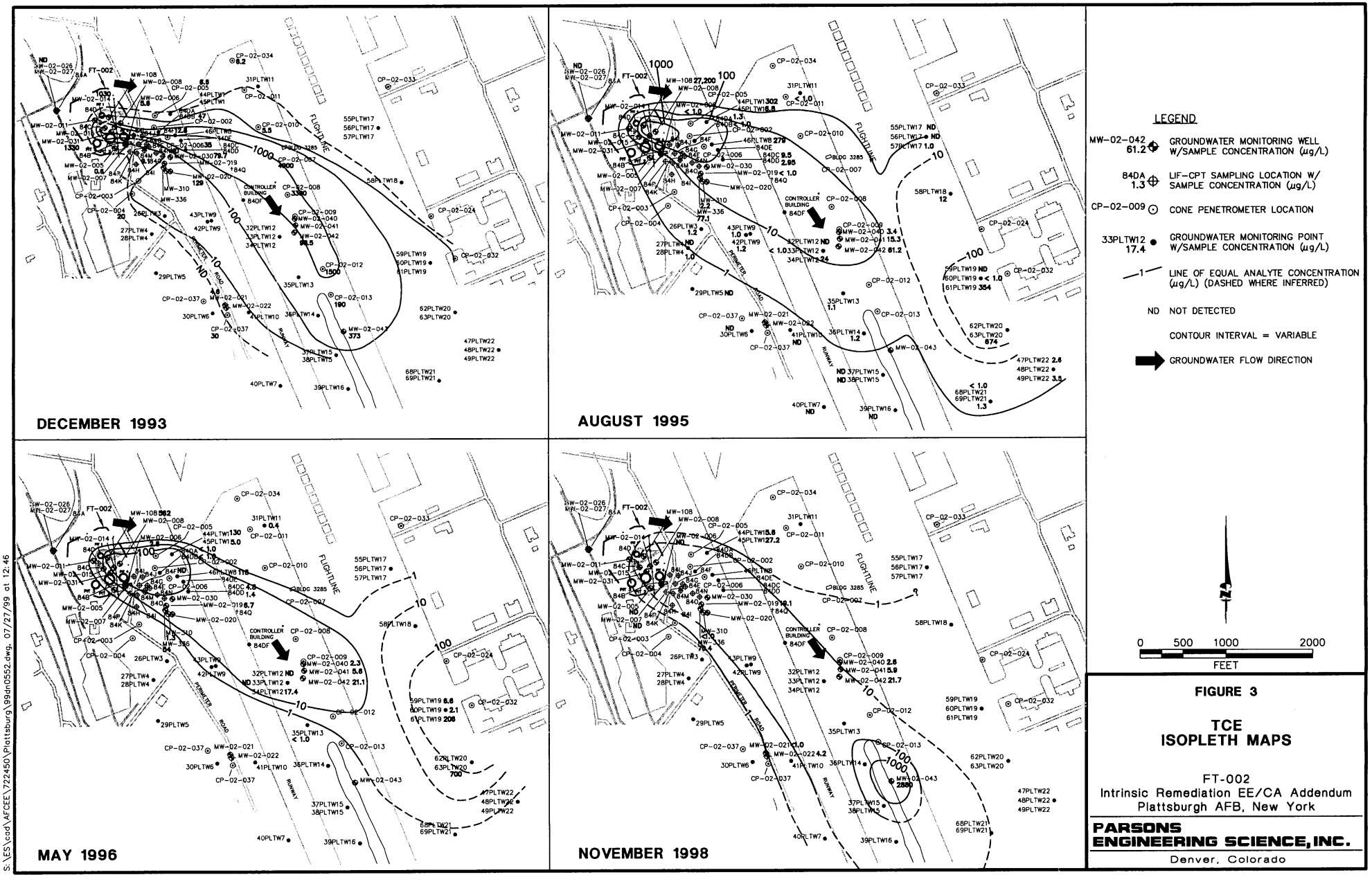

FIGURE 3

TCE ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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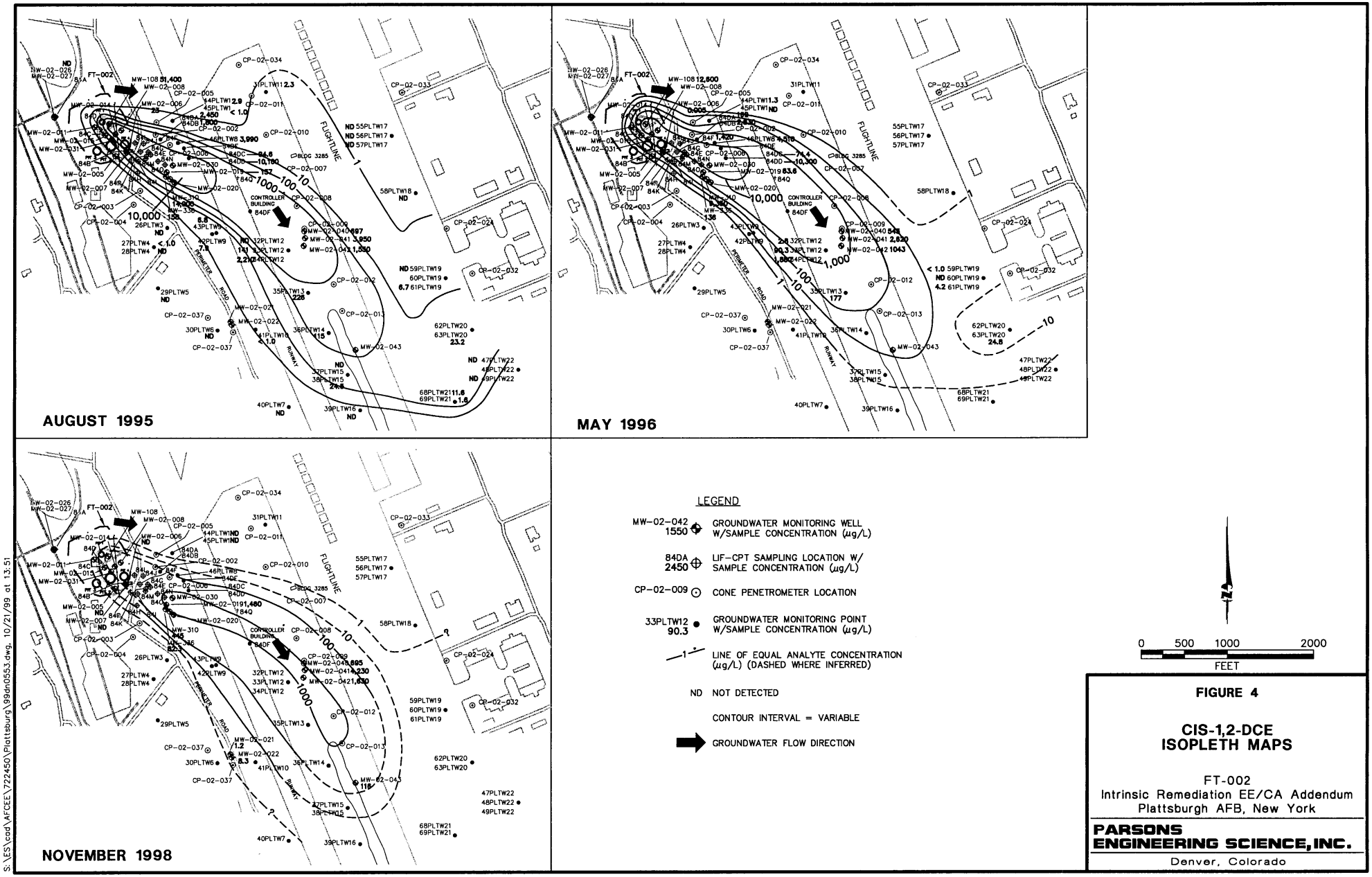

FIGURE 4

CIS-1,2-DCE ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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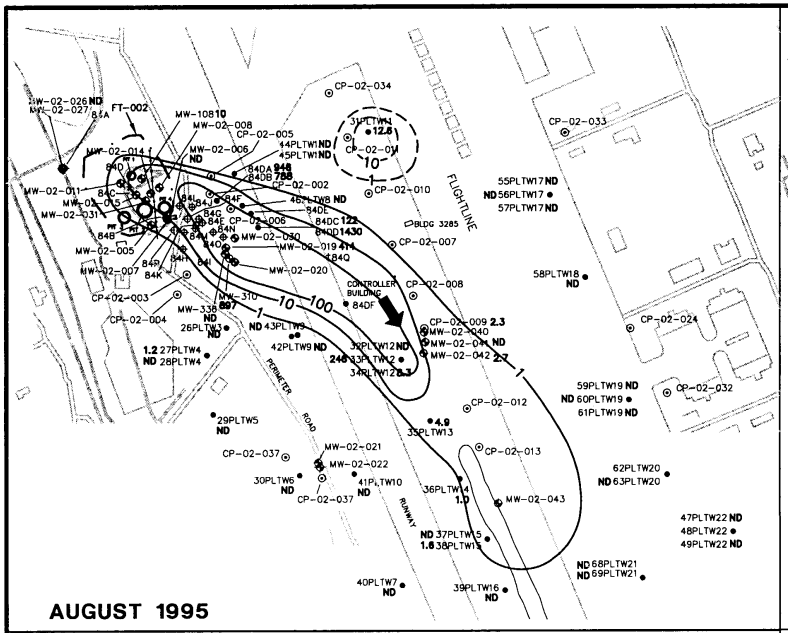

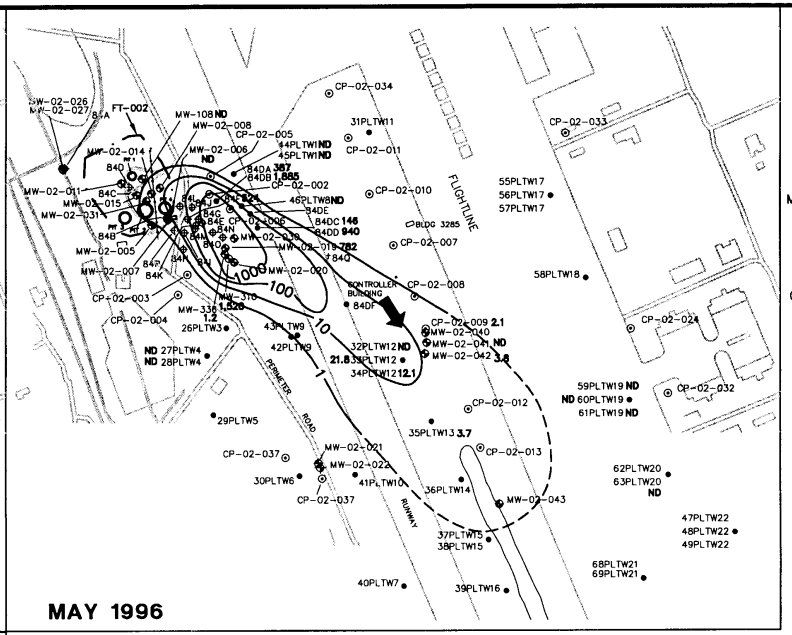

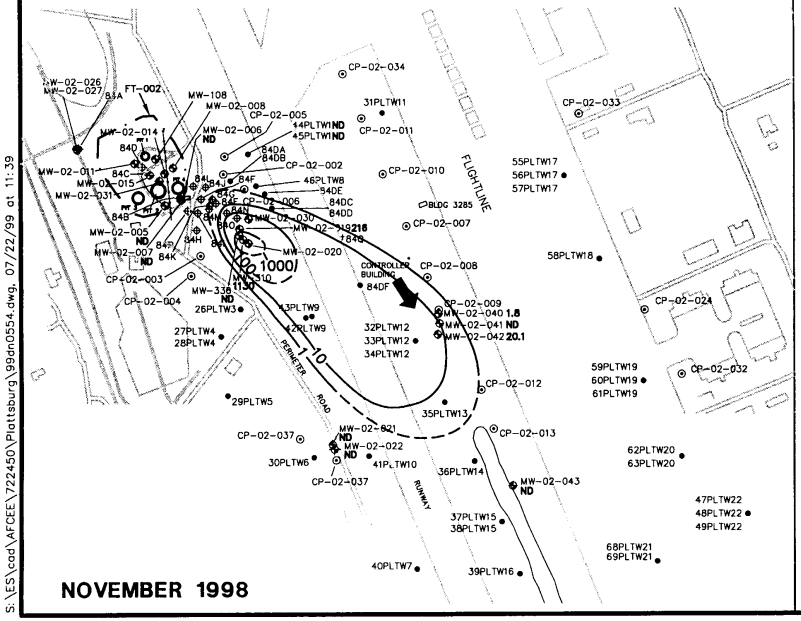

LEGEND

- MW-02-042 / 2.7 — GROUNDWATER MONITORING WELL W/SAMPLE CONCENTRATION (µg/L)
- 84DA / 946 — LIF-CPT SAMPLING LOCATION W/ SAMPLE CONCENTRATION (µg/L)
- CP-02-009 — CONE PENETROMETER LOCATION
- 33PLTW12 / 246 — GROUNDWATER MONITORING POINT W/SAMPLE CONCENTRATION (µg/L)
- 1 — LINE OF EQUAL ANALYTE CONCENTRATION (µg/L) (DASHED WHERE INFERRED)
- ND — NOT DETECTED
- CONTOUR INTERVAL = VARIABLE
- GROUNDWATER FLOW DIRECTION

N

0 500 1000 2000
FEET

FIGURE 5

VINYL CHLORIDE ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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(i.e., DCE and VC). Fuel hydrocarbons are completely degraded or detoxified if they are utilized as the primary electron donor for microbial metabolism (Bouwer, 1992). Electron acceptors are elements or compounds that occur in relatively oxidized states. Native electron acceptors include oxygen, nitrate, ferric iron, sulfate, and carbon dioxide. Microorganisms preferentially utilize electron acceptors while metabolizing fuel hydrocarbons (Bouwer, 1992). DO is utilized first as the prime electron acceptor. After the DO is consumed, anaerobic microorganisms typically use electron acceptors in the following order of preference: nitrate, ferric iron, sulfate, and finally carbon dioxide. Anaerobic destruction of the BTEX compounds is associated with the accumulation of fatty acids, production of methane, solubilization of iron, and reduction of nitrate and sulfate (Cozzarelli *et al.*, 1990; Wilson *et al.*, 1990). Under certain conditions, chlorinated ethenes also can be used as electron acceptors in microbially mediated redox reactions.

As a part of the November 1998 sampling event, analyses were performed on groundwater samples to determine the concentrations of geochemical indicators of intrinsic remediation. The results of these analyses are summarized in the following subsections.

2.4.1 Oxidation/Reduction Potential

ORP, a measure of the relative tendency of a solution to accept or transfer electrons, was measured at 16 wells sampled in November 1998. The dominant electron acceptor being reduced by microbes during BTEX oxidation is tied to the ORP of the groundwater. Measured site ORPs are summarized on Table 5.

The November 1998 ORP values at Site FT-002 range from -160 millivolts (mV) to 190 mV. Although measured site values are higher than the theoretical optimum levels for sulfate reduction and methanogenesis (Norris *et al.*, 1994), this discrepancy is a common problem associated with measuring oxidizing potential using field instruments. It is likely that the platinum electrode probes are not sensitive to some of the redox couples (e.g., sulfate/sulfide). Many authors have noted that field ORP data alone cannot be used to reliably predict the electron acceptors that may be operating at a site (Stumm and Morgan, 1981; Godsey, 1994; Lovley *et al.*, 1994). Integrating redox measurements with analytical data on reduced and oxidized chemical species allows a more thorough and reasonable interpretation of which electron acceptors are being used to biodegrade site contaminants. Groundwater data collected at Site FT-002 suggests that that both sulfate reduction and methanogenesis are continuing to occur even though the measured ORP range would exclude both processes.

Areas at the site with low ORPs continue to coincide with areas characterized by elevated BTEX concentrations; low DO, nitrate, and sulfate concentrations; and elevated ferrous iron and methane concentrations. This suggests that dissolved BTEX at the site is undergoing a variety of biodegradation processes, including aerobic respiration, denitrification, iron reduction, sulfate reduction, and methanogenesis. The same relationships between ORP and electron acceptor/byproduct concentrations were noted during the December 1993 and August 1995 sampling events (Parsons ES, 1997). Only very limited ORP data were collected in May 1996.

TABLE 5
GROUNDWATER QUALITY DATA FOR GEOCHEMICAL INDICATORS
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Temp. (°C)[a]	pH (su)[b]	Conductivity (µS/cm)[c]	Redox (mv)[d]	Dissolved Oxygen (mg/L)[e]	Nitrate+ Nitrite (mg/L)	Ammonia (mg/L)	Ferrous Iron (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	Methane (mg/L)	Ethane (mg/L)	Ethene (mg/L)	Alkalinity ($CaCO_3$) (mg/L)	Chloride (mg/L)	Carbon Dioxide (mg/L)	TOC (percent)	Hydrogen (nM)[f]
MW-02-005	11/98	9.9	5.9	428	-110	0.9	< 0.10	< 0.10	0.6	17.1	<0.1	ND[g]	ND	ND	140	38.7	NS[h]	1.26	NA[i]
	12/93	7.4	NA	NA	NA	2.1	0.1	0.64	NA	9.73	NA	0.005	NA	0.0005	232	142	250	5.30	NA
MW-02-006	11/98	10.9	5.8	788	-160	0.5	< 0.10	0.1	3.0	23.7	0.5	0.090	ND	ND	180	115	NS	0.624	NA
	8/95	13.8	7.2	1,120	-162	0.5	0.18	NA	2.6	30.9	<0.1	0.005	<0.002	ND	160	219	148	3.00	0.5
	12/93	9.9	NA	NA	-137	0.8	0.12	1.69	3.50	25.1	NR	0.007	NA	ND	109	193	117	4.80	NA
MW-02-007	11/98	8.4	5.8	244	-84	0.3	< 0.10	0.3	0.2	7.62	<0.1	0.108	ND	ND	80	11.9	NS	1.11	NA
	12/93	9.3	NA	NA	NA	1.1	0.1	0.25	NA	11.7	NR	0.204	NA	ND	113	8.22	80	0.50	NA
MW-02-014	12/93	9.31	NA	NA	NA	1.2	BLQ[j]	2.1	NA	BLQ	NA	0.307	NA	0.0032	227	63.5	319	37.40	NA
MW-02-015	12/93	9.3	NA	NA	NA	1	BLQ	0.59	NA	23.1	NA	0.000	NA	ND	96	26.6	107	5.50	NA
MW-02-017	11/98	9.1	6.4	398	144	7.5	1.27	< 0.10	< 0.1	13.3	<0.1	ND	ND	ND	180	14.0	NS	2.42	NA
MW-02-019	11/98	10.0	6.0	558	-128	<0.1	< 0.10	1.2	15.0	< 0.5	<0.1	0.020	ND	ND	240	7.09	NS	6.59	NA
	5/96	NA	NA	NA	NA	NA	< 0.05	NA	NA	< 0.5	NA	0.034	NA	0.420	NA	86.8	NA	6.00	NA
	8/95	14.0	7.2	692	-207	0.2	0.18	NA	10.8	< 0.5	<0.1	0.063	NA	0.0006	264	57.7	314	9.5	2.5
	12/93	10	7.4	644	-127	0.9	0.11	1.26	10.30	0.08	NA	0.111	NA	0.039	262	42.4	278	11.30	NA
MW-02-020	12/93	9.4	7.3	695	-117	1.3	0.12	3.04	10.7	BLQ	NA	0.295	NA	0.004	322	25.1	321	17.30	NA
MW-02-021	11/98	10.1	6.0	504	40	0.2	1.02	< 0.10	0.2	17.4	<0.1	0.026	ND	ND	200	8.96	NS	3.05	NA
	12/93	9.4	NA	NA	NA	1.4	0.55	0.59	NA	22	NA	0.075	NA	ND	261	9.14	290	4.60	NA
MW-02-022	11/98	10.4	5.9	596	-80	0.1	< 0.10	< 0.10	0.7	15.3	<0.1	0.242	ND	ND	220	19.6	NS	4.05	NA
MW-02-026	8/95	10.3	7.9	NA	210	10.6	0.47	NA	< 0.05	16.5	NA	< 0.001	ND	ND	64	144	36		NA
	12/93	7.2	7.8	627	153	10	0.44	BLQ	BLQ	19.6	NA	ND	NA	ND	111	103	102	0.80	NA
MW-02-027	12/93	6.4	12.1	8,670	-87	5.5	0.51	0.17	NA	1.79	NA	0.004	NA	0.0006	1590	84.7	ND	3.40	NA
MW-02-030	12/93	9.4	7.7	288	-107	2.2	0.09	0.2	BLQ	11.5	NA	0.168	NA	0.0002	110	13.5	102	0.90	NA
MW-02-040	11/98	9.6	6.1	778	182	0.1	163.0	0.1	< 0.1	6.24	<0.1	0.04	ND	ND	160	6.04	NS	1.80	NA
	5/96	NA	NA	NA	NA	NA	22.8	NA	NA	6.73	NA	0.029	NA	<0.003	NA	4.94	NA	4.10	NA
	8/95	13.1	7.7	621	207	0.3	33.3	NA	< 0.05	6.08	NA	0.030	<0.002	<0.003	159	4.76	98	2.80	0.1
	12/93	8	8.2	513	13	2.2	26.5	BLQ	BLQ	5.53	NA	0.009	NA	ND	136	2.14	119	1.40	NA
MW-02-041	11/98	9.6	6.1	664	50	0.1	0.53	< 0.10	< 0.1	0.85	<0.1	0.608	ND	0.002	260	13.4	NS	9.44	NA
	5/96	NA	NA	NA	NA	NA	0.24	NA	NA	1.33	NA	0.222	NA	<0.003	NA	10.6	NA	4.80	NA
	8/95	15.1	7.5	NA	202	0.5	2.01	NA	< 0.05	2.15	NA	0.240	0.002	<0.003	315	10.8	140	8.90	0.37
	12/93	8.4	7.9	682	8	3	0.69	BLQ	BLQ.	1.66	NA	0.160	NA	0.0005	350	11.2	334	11.40	NA
MW-02-042	11/98	10.0	6.1	386	-35	0.1	< 0.10	0.1	0.5	< 0.5	<0.1	0.799	ND	ND	160	11.8	NS	4.66	NA
	5/96	NA	NA	NA	NA	NA	< 0.05	NA	NA	0.63	NA	1.200	NA	0.003	NA	11	NA	4.90	NA
	8/95	13.3	7.9	381	160	0.9	0.21	NA	< 0.05	< 0.5	NA	1.29	0.002	0.004	177	11.4	80	6.00	0.47
	12/93	7.6	7.9	330	-37	2.4	0.13	0.117	BLQ	0.26	NA	0.503	NA	0.0035	157	11.3	164	6.00	NA
MW-02-043	11/98	10.2	5.9	655	122	0.1	12.8	< 0.10	0.2	15.2	<0.1	0.002	ND	ND	160	2.75	NS	4.28	NA
	12/93	9.4	NA	NA	NA	1.4	31.1	BLQ	NA	13	NA	0.001	NA	ND	180	0.93	225	1.0	NA
MW-02-044	12/93	8.9	6.9	1,172	-177	2.5	94.9	0.83	BLQ	9	NA	0.001	NA	ND	110	BLQ	294.00	1.4	NA
MW-02-108	5/96	12.1	7.1	831	-4	0.5	< 0.05	NA	45.6	0.96	0.1	1.6	NA	<0.002	330	0.96	NA	93.50	NA
	8/95	12.0	6.8	623	-139	0.1	0.18	NA	4.0	5.51	NA	1.42	0.006	<0.003	204	62.6	NA	80.4	6.7
MW-310	11/98	9.8	5.9	741	-105	<0.1	< 0.10	2.5	12 0	< 0.5	<0.1	0.467	0.363	ND	220	78.4	NS	12.7	NA
	5/96	10.3	6.9	704	-75	0.1	< 0.05	NA	16	< 0.05	0.1	0.339	NA	0.013	300	42.5	NA	31.10	NA
	8/95	13.5	6.9	785	-160	0.5	0.20	NA	15.3	< 0.05	<0.1	0.305	0.002	0.035	330	47.9	374	30.40	NA

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MW-336	11/98	9.5	5.8	408	-135	0.2	< 0.10	0.2	< 0.1	14.9	<0.1	0.162	ND	ND	100	52.4	NS	1.50	NA
	5/96	NA	NA	308	NA	NA	0.08	NA	NA	11.8	NA	0.138	NA	<0.003	NA	20.3	NA	1.20	0.54
	8/95	15.0	7.9	320	-196	0.6	0.16	NA	<0.05	12.1	<0.1	0.198	ND	0.000	134	20.1	76	2.10	NA
25-PLT-W2	8/95	13.6	7.8	926	54	6.7	0.53	NA	<0.05	31.3	NA	<0.001	ND	ND	134	182	112	1.50	NA
26-PLT-W3	8/95	12.3	7.5	672	-98	0.6	1.06	NA	NA	19.7	0.1	< 0.001	ND	ND	176	89.9	66	1.30	NA
27-PLT-W4	8/95	13.2	7.0	976	-185	0.1	0.19	NA	NA	42.7	<0.1	0.119	ND	ND	278	109	104	3.00	NA
28-PLT-W4	8/95	20.8	7.9	600	54	7.5	1.36	NA	NA	19.3	NA	< 0.001	ND	ND	154	76	198	12.40	NA
29-PLT-W5	8/95	16.0	7.9	348	-50	0.8	0.14	NA	< 0.05	17.2	<0.1	0.088	ND	ND	130	23.8	68	0.50	NA
30-PLT-W6	8/95	13.3	8.0	490	-255	0.5	0.12	NA	< 0.05	6.22	<0.1	1.20	ND	ND	109	73	64	1.00	NA
31-PLT-W11	8/95	14.8	7.5	840	-110	0.7	0.16	NA	0.4	12.6	NA	13.9	<0.002	ND	388	36.6	226	3.10	NA
32-PLT-W12	5/96	7.8	7.8	490	166	0.1	39.5	NA	< 0.1	3.76	<0.1	0.002	NA	ND	86	0.77	NA	0.80	NA
	8/95	14.6	7.7	521	135	0.6	33.0	NA	< 0.05	4.48	NA	0.001	ND	ND	104	0.78	56	0.50	NA
33-PLT-W12	5/96	NA	NA	339	NA	NA	8.7	NA	NA	5.61	<0.1	0.051	NA	ND	NA	2.28	NA	2.20	NA
	8/95	12.1	7.6	420	132	0	7.99	NA	< 0.05	6.1	NA	0.285	<0.002	0.007	168	4.12	68	4.10	NA
34-PLT-W12	5/96	7.8	6.6	559	166	0.1	< 0.05	NA	< 0.1	0.96	<0.1	1.790	NA	<0.003	86	18.4	NA	8.20	NA
	8/95	13.9	7.5	587	-154	0.9	0.29	NA	0.7	0.52	0.1	3.53	<0.002	<0.003	260	19.5	72	8.10	NA
35-PLT-W13	5/96	8.7	8.2	412	3	0.2	9.49	NA	0.11	14.4	<0.1	0.044	NA	NA	NA	2.63	NA		NA
	8/95	16.4	7.8	458	134	0.4	10.4	NA	< 0.05	14.7	NA	0.115	ND	<0.003	185	3.29	36	2.40	NA
36-PLT-W14	8/95	15.5	7.4	630	-155	0.5	0.19	NA	0.9	139	<0.1	0.065	ND	ND	193	8.25	76	1.20	NA
37-PLT-W15	8/95	19.5	6.4	777	-99	1.4	0.16	NA	52.5	< 0.5	NA	13.9	<0.002	ND	404	3.74	NA	18.60	NA
38-PLT-W15	8/95	17.5	7.9	390	-280	0.9	0.14	NA	0.1	< 0.5	0.1	4.40	ND	ND	90	9.03	88	3.90	NA
39-PLT-W16	8/95	13.9	7.3	536	-50	0.2	3.31	NA	< 0.05	12.5	<0.1	0.014	ND	ND	261	1.25	134	1.70	NA
40-PLT-W7	8/95	13.5	6.8	944	-140	0.5	0.16	NA	29.8	< 0.5	<0.1	21.4	<0.002	ND	526	1.15	NA	12.70	NA
41-PLT-W10	8/95	14.7	7.3	608	54	0.2	4.24	NA	NA	12.4	NA	0.045	ND	ND	294	0.81	180	2.60	NA
42-PLT-W9	8/95	15.2	7.3	616	25	0.4	0.62	NA	< 0.05	17.8	NA	< 0.001	ND	ND	280	16.4	198	4.30	NA
43-PLT-W9	8/95	14.7	7.3	506	-20	0.2	0.20	NA	0.1	13.5	NA	< 0.001	ND	ND	237	11.1	124	3.20	NA
44-PLT-W1	11/98	9.7	6.0	699	-105	0.1	< 0.10	< 0.10	0.6	20.7	<0.1	NA	NA	NA	140	114	NS	1.12	NA
	5/96	NA	NA	657	NA	NA	0.57	NA	NA	15.4	NA	< 0.001	NA	ND	NA	65.2	NA	1.30	NA
44-PLT-W1	8/95	15.2	7.6	596	138	7.5	0.62	NA	< 0.05	13.6	NA	< 0.001	ND	ND	231	42.5	84	1.70	NA
45-PLT-W1	11/98	11.4	6.5	685	190	8.3	0.63	< 0.10	< 0.1	17.8	<0.1	ND	ND	ND	200	71.6	NS	0.76	NA
	5/96	NA	NA	621	NA	NA	< 0.05	NA	NA	20.3	NA	< 0.001	NA	ND	NA	95.2	NA	0.89	NA
45-PLT-W1	8/95	16.9	7.7	625	-50	0.5	0.17	NA	< 0.05	20.8	<0.1	0.001	ND	ND	169	94.2	110	0.60	NA
46-PLT-W8	5/96	NA	NA	686	NA	NA	< 0.05	NA	NA	< 0.5	NA	NA	NA	NA	255	51.6	NA		NA
	8/95	16.3	7.1	708	-60	0.6	0.18	NA	0.8	< 0.5	<0.1	0.009	<0.002	<0.003	279	58.5	242	8.30	NA
47-PLT-W22	8/95	NA	8.6	256	81	NA	0.17	NA	< 0.05	0.59	NA	1.88	<0.002	ND	214	0.85	NA	3.30	NA
49-PLT-W22	8/95	17.3	7.8	289	-230	0.3	0.12	NA	< 0.05	12.6	0.1	1.19	<0.002	ND	117	20.6	60	0.80	NA
55-PLT-W17	8/95	14.8	7.6	251	-150	0.3	0.13	NA	0.3	< 0.5	<0.1	3.09	ND	ND	128	12.5	46	1.30	NA
56-PLT-W17	8/95	16.3	7.9	481	99	0.3	31.0	NA	0.1	8.58	NA	0.049	ND	ND	114	2.22	36	0.20	NA
57-PLT-W17	8/95	15.8	7.6	513	75	0.1	31.1	NA	0.1	9.52	NA	0.045	ND	ND	117	4.46	102	0.70	NA
58-PLT-W18	8/95	22.3	7.9	225	142	3.2	0.14	NA	NA	2.89	NA	2.14	ND	ND	137	1.13	102	2.90	NA

TABLE 5
GROUNDWATER QUALITY DATA FOR GEOCHEMICAL INDICATORS
FT-002
INTRINSIC REMEDIATION EE/CA ADDENDUM II
PLATTSBURGH AFB, NEW YORK

Sample Location	Sample Date	Temp. (°C)[a/]	pH (su)[b/]	Conductivity (µS/cm)[c/]	Redox (mv)[d/]	Dissolved Oxygen (mg/L)[e/]	Nitrate+ Nitrite (mg/L)	Ammonia (mg/L)	Ferrous Iron (mg/L)	Sulfate (mg/L)	Sulfide (mg/L)	Methane (mg/L)	Ethane (mg/L)	Ethene (mg/L)	Alkalinity ($CaCO_3$) (mg/L)	Chloride (mg/L)	Carbon Dioxide (mg/L)	TOC (percent)	Hydrogen (nM)[f/]
59-PLT-W19	5/96	NA	NA	265	NA	NA	0.45	NA	NA	2.60	NA	0.909	NA	<0.003	NA	1.24	NA	1.50	NA
	8/95	18.2	8.5	260	-220	1.2	0.11	NA	< 0.05	0.91	<0.1	1.25	0.002	<0.003	212	1.2	NA	2.20	NA
60-PLT-W19	5/96	NA	NA	197	NA	NA	0.07	NA	NA	5.59	NA	0.280	NA	ND	NA	3.38	NA	1.10	NA
	8/95	16.5	8.3	202	-130	0.2	0.11	NA	< 0.05	7.28	<0.1	0.224	ND	ND	218	3.36	NA	1.00	NA
61-PLT-W19	5/96	NA	NA	569	NA	NA	30.1	NA	NA	9.30	NA	0.003	NA	ND	NA	2.44	NA	2.10	NA
	8/95	17.1	7.3	601	-30	0.1	26.2	NA	0.4	9.96	<0.1	0.002	ND	ND	185	3.36	80	0.90	NA
63-PLT-W20	5/96	NA	NA	682	NA	NA	39.5	NA	NA	9.13	NA	0.017	NA	ND	NA	2.88	NA	2.10	NA
	8/95	17.4	7.2	NA	110	0.1	34.8	NA	< 0.05	9.32	NA	0.156	ND	ND	260	2.17	142	1.10	NA
69-PLT-W21	8/95	16.9	6.7	830	-120	0.1	1.14	NA	13.3	4.88	<0.1	0.594	ND	ND	425	1.49	NA	4.30	NA
84DA	5/96	NA	NA	501	NA	NA	< 0.05	NA	NA	1.18	NA	0.074	NA	0.257	NA	49	NA	1.70	NA
	8/95	14.6	7.0	593	-171	0.4	0.17	NA	14.5	< 0.5	<0.1	0.088	<0.002	0.028	252	33.9	330	7.60	NA
84DB	5/96	NA	NA	637	NA	NA	< 0.05	NA	NA	< 0.5	NA	0.275	NA	0.713	NA	45.9	NA	6.10	NA
	8/95	12.1	6.9	640	-165	0.4	0.17	NA	17.3	< 0.5	<0.1	0.180	<0.002	0.208	282	34.5	278	14.5	NA
84DC	5/96	9.2	7.2	314	9	0.2	< 0.05	NA	19.1	8.92	<0.1	0.018	NA	0.089	137	27.5	NA	2.14	NA
	8/95	15.6	7.0	258	-199	0.4	0.14	NA	8.3	12.7	<0.1	< 0.001	ND	0.017	NA	15.6	124	1.4	NA
84DD	5/96	9.3	7.2	723	2	0.2	< 0.05	NA	19.3	< 0.5	<0.1	0.714	NA	0.170	256	57.2	NA	24.30	NA
	8/95	15.2	7.0	770	-160	0.4	0.17	NA	13.8	< 0.5	<0.1	1.01	0.002	0.182	347	45.9	288	21.30	NA
84DF-22	5/96	NA	NA	NA	NA	NA	4.92	NA	NA	NA	NA	0.045	NA	0.0040	NA	NA	NA	4.50	NA
84DF-34	5/96	NA	NA	518	NA	NA	0.08	NA	NA	1.51	NA	0.617	NA	0.0040	NA	13.6	NA	13.80	NA
84B (207.22)[k/]	12/93	NA	NA	NA	-21	NA	0.19	1.36	0.50	5.49	NA	0.030	NA	ND	179	222	176	11.30	NA
84B (186.02)	12/93	NA	NA	516	153	NA	0.19	0.27	BLQ	18.8	NA	0.016	NA	ND	135	69.2	121	6.2	NA
84E (210.52)	12/93	NA	7.4	695	-47	NA	BLQ	2.15	1.20	5.78	NA	0.099	NA	0.220	268	54.6	490	15.50	NA
84E (190.52)	12/93	NA	7.5	784	-72	NA	0.05	2.12	1.20	7.15	NA	0.322	NA	0.0055	290	65	426	36.7	NA
84E (174.52)	12/93	NA	7.8	416	130	NA	0.15	0.23	BLQ	20.3	NA	0.008	NA	ND	35	35.7	124	7.6	NA
84F (207.26)	12/93	NA	7.1	722	-67	NA	0.06	2.6	2.60	5.43	NA	0.512	NA	0.1287	285	80	550	21.0	NA
84F (197.26)	12/93	NA	7.4	794	-89	NA	0.06	6.11	5.30	BLQ	NA	0.134	NA	0.0012	140	72	356	22.5	NA
84F (192.26)	12/93	NA	7.3	725	-82	NA	BLQ	3.99	2.30	BLQ	NA	0.088	NA	0.0009	224	78.5	323	17.7	NA
84F (177.26)	12/93	NA	7.8	410	93	NA	BLQ	0.36	BLQ	22	NA	0.011	NA	ND	136	37.3	138	3.6	NA
84M (203.4)	12/93	NA	7.2	884	-97	NA	0.12	4.98	8.90	3.44	NA	0.121	NA	0.0284	290	94.3	899	36.6	NA
84M (183.4)	12/93	NA	8.4	370	10	NA	0.14	1.09	BLQ	14.6	NA	0.020	NA	ND	161	26.9	369	3.1	NA
84N (204.15)	12/93	NA	7.1	725	-67	NA	0.12	1.66	2.90	0.21	NA	0.100	NA	0.4738	288	54.6	484	22.5	NA
84N (184.15)	12/93	NA	7.6	720	-71	NA	0.16	1.64	0.80	0.34	NA	0.162	NA	0.0021	132	68.8	374	20.0	NA
84O (203.1)	12/93	NA	7.2	590	-97	NA	0.17	1.51	3.70	0.33	NA	0.092	NA	0.0397	267	28.3	618	16.2	NA
84O (188.1)	12/93	NA	NA	NA	NA	NA	0.13	2.83	0.00	0.5	NA	0.123	NA	0.0023	234	55.2	303	14.3	NA

[a/] °C = Degrees Celcius.
[b/] su = Standard Units.
[c/] mS/cm = Micro siemens per centimeter.
[d/] mv = Millivolts.
[e/] mg/L = Milligrams per liter.
[f/] nM = Nano meters.
[g/] ND = Not detected.
[h/] NS = Not sampled.
[i/] NA = Not analyzed.
[j/] BLQ = Below limit of practical quantitation.
[k/] Samples collected with cone-penetrometer apparatus at indicated elevation in mean sea level.

2.4.2 Dissolved Oxygen

DO concentrations were measured at 15 groundwater sampling locations in November 1998. Table 5 summarizes DO concentrations measured at groundwater monitoring locations at Site FT-002 since December 1993. Figure 6 presents isopleth maps of DO at the site in August 1995 and November 1998. Comparison of Figures 2 and 6 shows that the BTEX plume core area at Site FT-002 continues to be essentially anaerobic. In fact, DO concentrations measured in November 1998 are similar to or lower than concentrations detected in August 1995. However, the DO levels measured at wells 44-PLT-W1 and 45-PLT-W1 are reversed from those measured in August 1995, suggesting that results were associated with the wrong well during one of the sampling events.

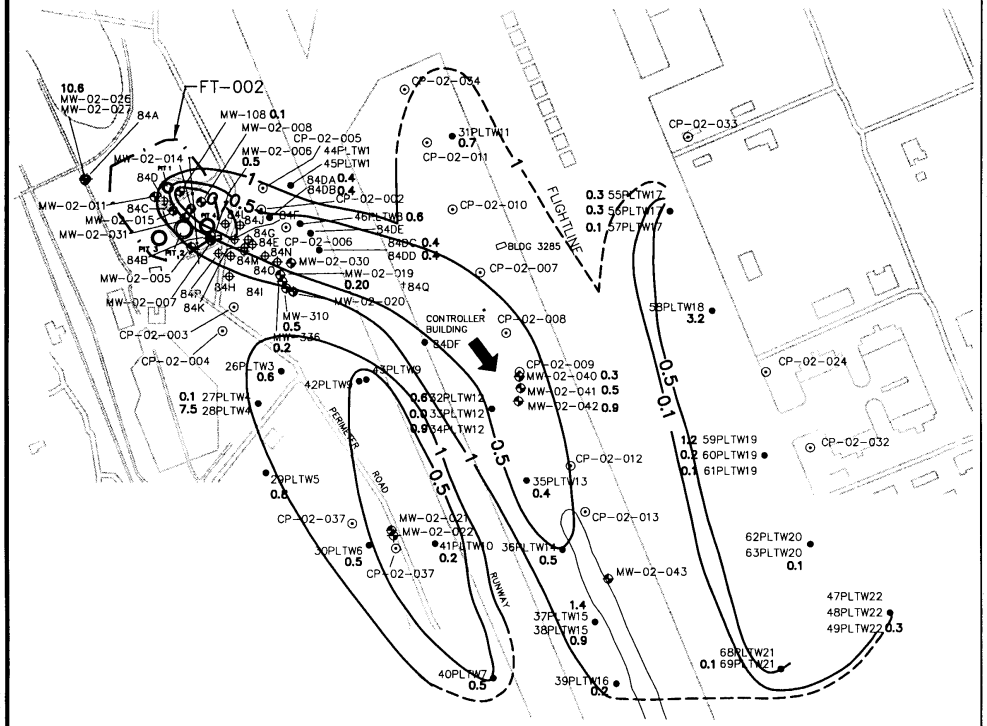
The correlation between depleted DO and elevated BTEX concentrations is a strong indication that aerobic biodegradation of the BTEX compounds has occurred, and continues to occur, at the site. The greatest aerobic activity is expected to occur at the upgradient perimeter of the source area and along the fringes of the plume, because these are areas where BTEX-contaminated groundwater mixes with groundwater containing higher concentrations of DO.

2.4.3 Nitrate + Nitrite

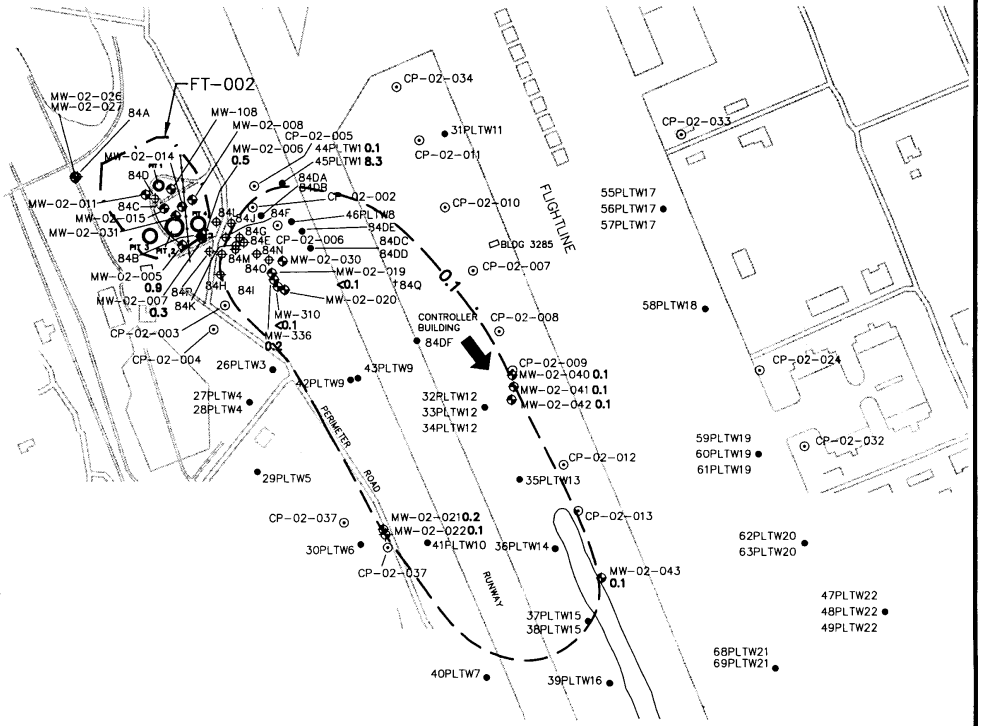
Concentrations of nitrate + nitrite (as nitrogen) were detected at 6 of the 15 locations sampled in November 1998. Nitrate + nitrite results measured at groundwater monitoring locations in November 1998 are presented on Table 5. Both the EE/CA (Parsons ES, 1995) and the first update sampling addendum (Parsons ES, 1997) stated that sampling results for nitrate indicated that dissolved BTEX was biodegrading via the microbially mediated processes of denitrification and/or nitrate reduction. Most of the November 1998 nitrate data was collected in the plume area, and the concentrations were generally less than 0.1 mg/L, supporting the continued depletion of nitrate in the plume area due to use of nitrate as an electron acceptor to biodegrade BTEX. The nitrate concentrations detected at 45-PLT-W1 (0.63 mg/L) and MW-02-43 (12.8 mg/L) suggest that nitrate concentrations cross-gradient and upgradient from the plume were higher than in the plume core in November 1998. However, the data are insufficient to confirm that this was the case.

2.4.4 Ferrous Iron

Ferrous iron concentrations were detected at 11 of the 15 locations sampled during the November 1998 sampling event. Table 5 lists ferrous iron concentrations measured at site groundwater monitoring locations in November 1998. Figure 7 presents isopleth maps showing the August 1995 and November 1998 distributions of ferrous iron in groundwater. Comparison of Figures 2 and 7 indicate that areas with elevated total BTEX concentrations continued to have elevated concentrations of ferrous iron. For example, the highest ferrous iron concentrations of 12.0 and 15.0 mg/L were detected in MW-310 and MW-02-019, respectively; these monitoring wells also evidenced the highest BTEX concentrations during the November 1998 sampling event (Figure 2). The ferrous iron concentrations measured in November 1998 were generally similar to or slightly greater than the April 1995 concentrations, suggesting that ferrous iron was



AUGUST 1995



NOVEMBER 1998

LEGEND

- MW-02-026 <0.05 — GROUNDWATER MONITORING WELL W/SAMPLE CONCENTRATION (mg/L)
- 84M — LIF-CPT SAMPLING LOCATION W/ SAMPLE CONCENTRATION (mg/L)
- CP-02-008 — CONE PENETROMETER LOCATION W/SAMPLE CONCENTRATION (mg/L)
- 55PLTW17 0.3 — GROUNDWATER MONITORING POINT W/SAMPLE CONCENTRATION IN (mg/L)
- 1.0 — LINE OF EQUAL BYPRODUCT CONCENTRATION (mg/L) (DASHED WHERE INFERRED)
- ND — NOT DETECTED
- CONTOUR INTERVAL = VARIABLE
- GROUNDWATER FLOW DIRECTION

N

0 375 750 1500
FEET

FIGURE 6

DISSOLVED OXYGEN ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

PARSONS ENGINEERING SCIENCE, INC.
Denver, Colorado

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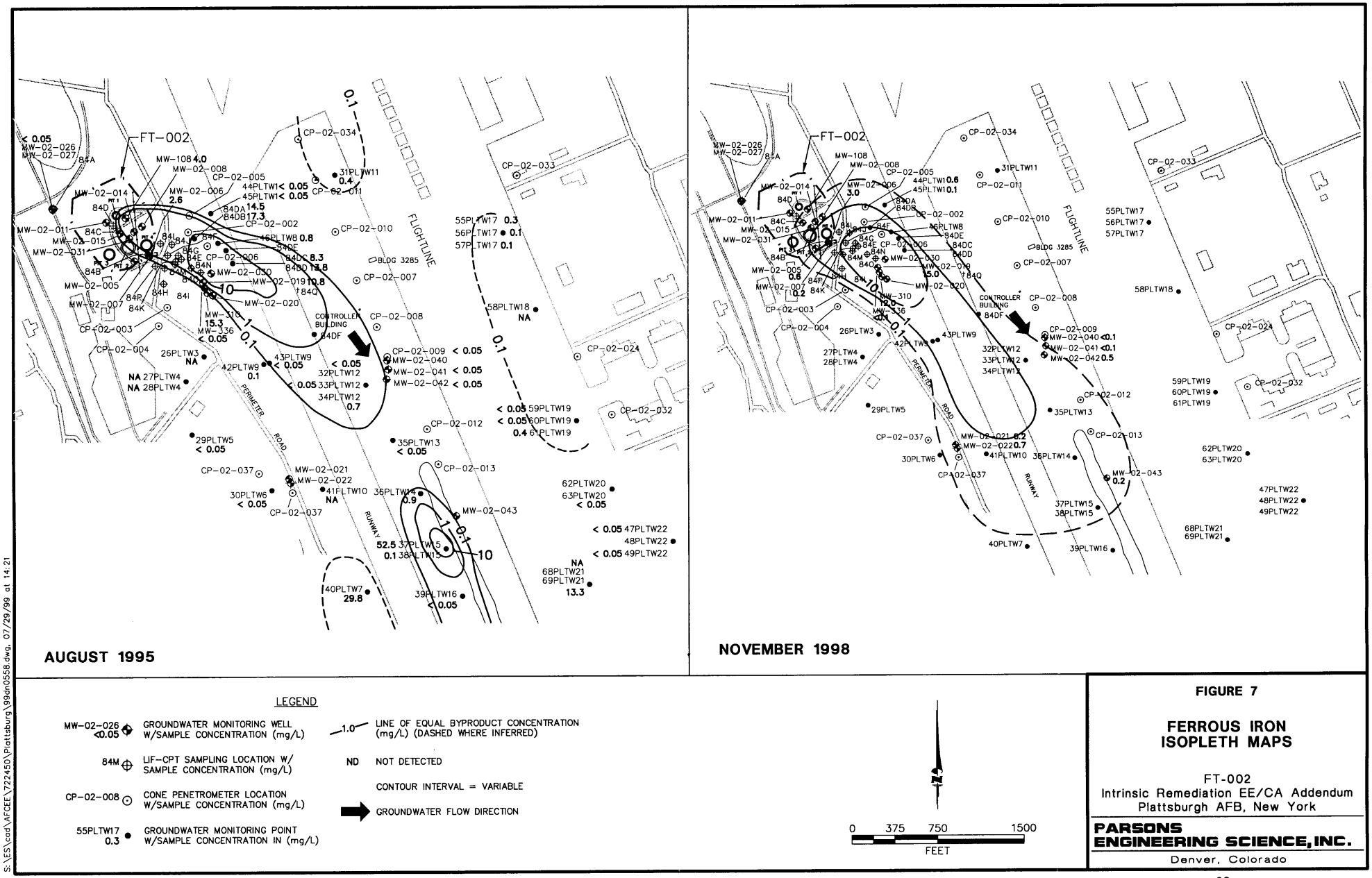

FIGURE 7

FERROUS IRON ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

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Denver, Colorado

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elevated in the plume core area. An exception occurred at MW310, where the 1998 ferrous iron concentration (12.0 mg/L) was less than the 1995 concentration (15.3 mg/L).

Studies suggest that the reduction of ferric iron to ferrous iron cannot proceed without microbial mediation (Lovley and Phillips, 1988; Lovley *et al.*, 1991; Chapelle, 1993); therefore, the continued presence of ferrous iron strongly indicates that ferric iron continues to be used as an electron acceptor at the site during biodegradation of BTEX compounds.

2.4.5 Sulfate

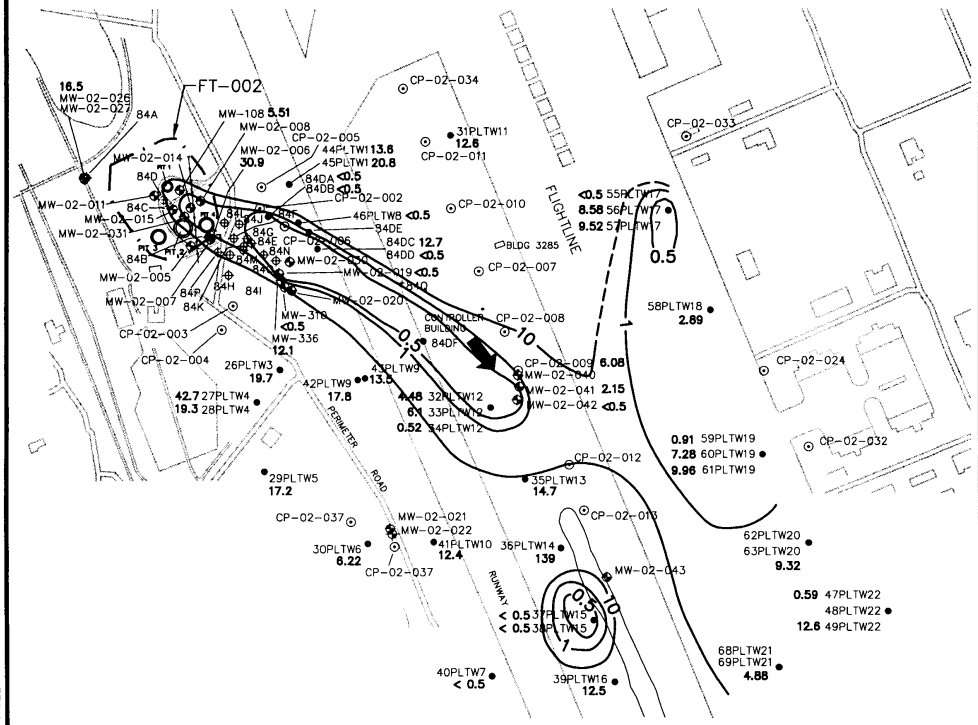
Sulfate concentrations were detected at 13 of the 15 locations sampled in November 1998. Results for sulfate analyses performed at groundwater monitoring locations at FT-002 are summarized on Table 5. An isopleth map for the November 1998 sulfate results is provided on Figure 8. Comparison of Figures 2 and 8 indicates that the areas with the highest total BTEX concentrations continue to have depleted sulfate concentrations. Sulfate concentrations measured in November 1998 are similar to the August 1995 concentrations, with no apparent increasing or decreasing trends. The correlation of depleted sulfate concentrations with the highest BTEX concentrations provides strong evidence that anaerobic biodegradation of the BTEX compounds continues through the microbially mediated process of sulfate reduction.

2.4.6 Methane

Methane concentrations were detected at 12 of 14 locations sampled for methane in November 1998. Methane concentrations measured in Site FT-002 groundwater samples collected since December 1993 are presented in Table 5. Figure 9 presents isopleth maps for August 1995 and November 1998 methane data. In areas with total BTEX concentrations greater than 50 μg/L, methane concentrations ranged from 0.02 mg/L to 0.80 mg/L. The methane concentrations measured in 1998 are similar to those measured in August 1995, with no apparent increasing or decreasing trends. The relationship between the methane and BTEX plumes can be observed through comparison of Figures 2 and 9. Elevated methane concentration have been detected outside of the BTEX plume as well. However, the continuing presence of concomitant BTEX and methane plumes at the site is a strong indication that anaerobic biodegradation of the BTEX compounds is continuing at the site through the microbially mediated process of methanogenesis.

2.5 Biodegradation of Chlorinated Solvents

At Site FT-002, the occurrence of sulfate reduction, methanogenesis, and low ORPs in the core of contaminant plume indicate that redox conditions are suitable for reductive dehalogenation of CAHs to occur. TCE daughter products are present at relatively high concentrations. *cis*-1,2-DCE (a daughter product of the reductive dehalogenation of TCE) is present more frequently and at higher concentrations than any other CAH at the site (Table 4). The presence of high concentrations of *cis*-1,2-DCE in association with low concentrations of *trans*-1,2-DCE in site groundwater provides further evidence of reductive dehalogenation, because the *cis* isomer is



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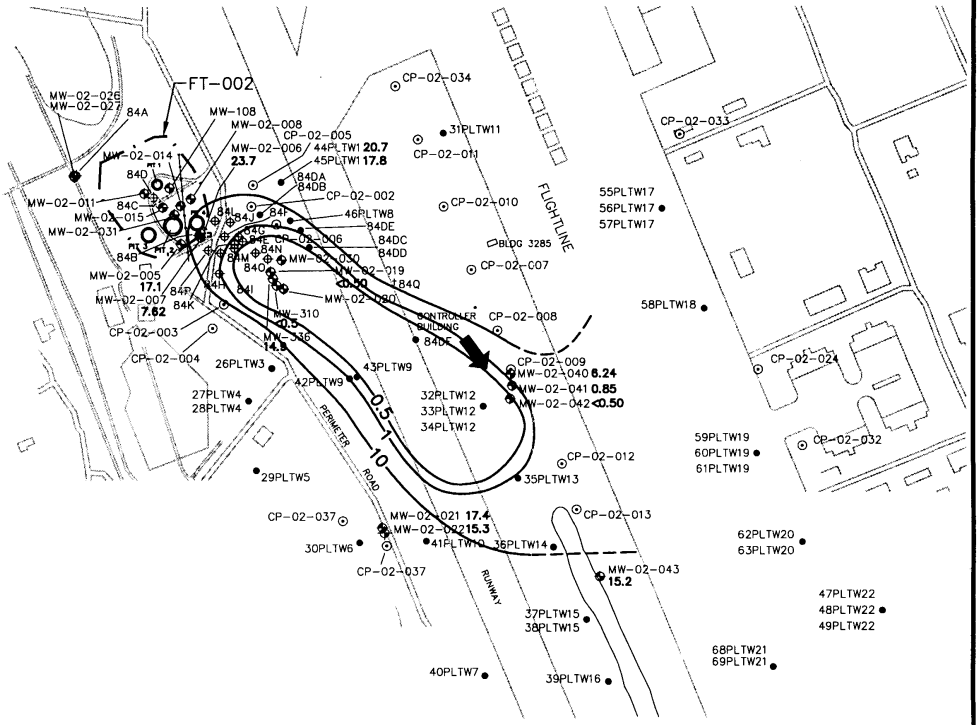

NOVEMBER 1998

LEGEND

- MW-02-026 <0.05 — GROUNDWATER MONITORING WELL W/SAMPLE CONCENTRATION (mg/L)
- 84M — LIF-CPT SAMPLING LOCATION W/ SAMPLE CONCENTRATION (mg/L)
- CP-02-008 — CONE PENETROMETER LOCATION W/SAMPLE CONCENTRATION (mg/L)
- 55PLTW17 0.3 — GROUNDWATER MONITORING POINT W/SAMPLE CONCENTRATION IN (mg/L)
- 1.0 — LINE OF EQUAL BYPRODUCT CONCENTRATION (mg/L) (DASHED WHERE INFERRED)
- ND — NOT DETECTED
- CONTOUR INTERVAL = VARIABLE
- GROUNDWATER FLOW DIRECTION

N

0 375 750 1500
FEET

FIGURE 8

SULFATE ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

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Denver, Colorado

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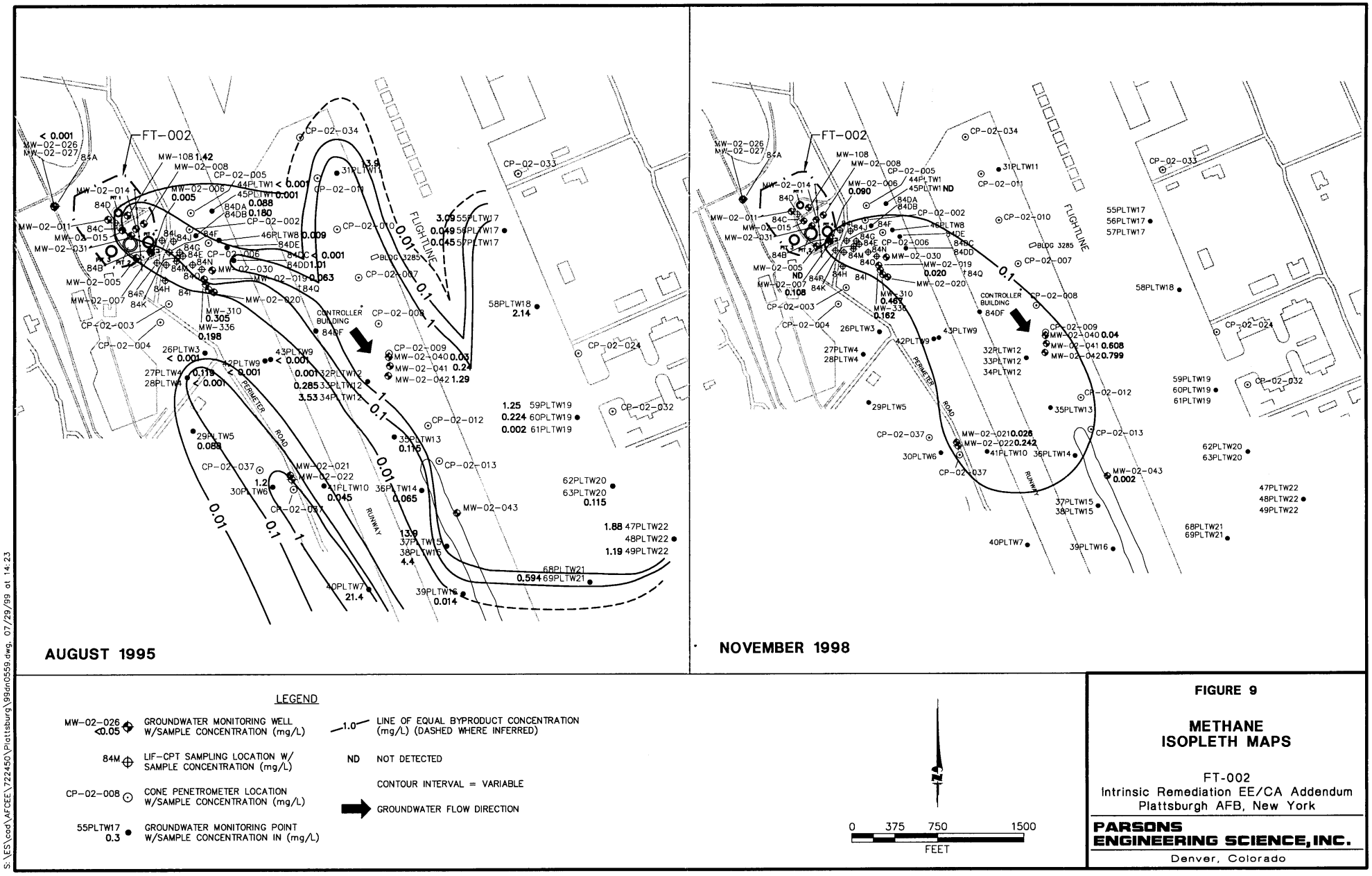

FIGURE 9

METHANE ISOPLETH MAPS

FT-002
Intrinsic Remediation EE/CA Addendum
Plattsburgh AFB, New York

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preferentially produced when TCE is reductively transformed. VC has continuously represented approximately 7 to 10 percent of the total dissolved chlorinated ethene concentration in site groundwater; therefore, reductive dehalogenation of *cis*-1,2-DCE to VC also is occurring. The relatively high ratio of *cis*-1,2-DCE to VC indicates that the groundwater system is not sufficiently reducing to reductively transform all of the DCE to VC.

2.5.1 Ethene

Ethene is produced when VC is reductively dehalogenated. Dissolved ethene concentrations were detected in only 2 of the 15 groundwater samples collected in November 1998 (Table 5). Each of the detected concentrations was 0.002 mg/L. Ethene previously had been detected in groundwater samples from multiple well/point locations from 1993 to 1996 at concentrations ranging up to 0.71 mg/L at location 84D within the general source area (Table 5, Figure 1). The decreased frequency of ethene detection suggests that groundwater redox conditions are becoming less reducing over time, inhibiting the reductive transformation of VC to ethene.

2.5.2 Chloride

Chloride concentrations were measured in groundwater samples collected in November 1998 (Table 5). Chloride is a byproduct of the biodegradation of chlorinated solvents. The November 1998 chloride concentrations detected in seven groundwater samples that contained more than 100 µg/L of total CAHs ranged from 2.75 mg/L to 78.4 mg/L, and averaged 24.5 mg/L. Conversely, chloride concentrations detected in eight samples that contained less than 100 µg/L of total CAHs ranged from 8.96 mg/L to 115 mg/L, and averaged 49.2 mg/L. Upgradient chloride concentrations detected in groundwater during previous sampling events at wells MW-02-026 and -027 have ranged from 84.7 to 144 mg/L. Therefore, the background chloride concentration appears to mask any increase in chloride that may have occurred as a result of chlorinated solvent degradation. Instead, the presence of biodegradation daughter products (*cis*-1,2-DCE, VC, and ethene) serve as better indicators of CAH biodegradation.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Results from the long-term groundwater monitoring conducted during November 1998 continue to support the occurrence of intrinsic bioremediation of dissolved BTEX and CAHs at Site FT-002. The combined effects of LNAPL recovery, bioventing with SVE, and natural attenuation in the source area appear to be effectively decreasing dissolved BTEX concentrations in this area. As a result, the dissolved BTEX plume appears to have become detached from the source area. LTM data suggest the BTEX plume has expanded toward the southeast since 1993; however, more recent data indicate that the plume has achieved a steady-state condition. Continued remediation of the BTEX source should cause the plume to diminish in the future.

Geochemical natural attenuation indicator parameter data collected in November 1998 indicate that aerobic and anaerobic natural attenuation processes are continuing to degrade dissolved BTEX in an uninterrupted fashion. Concentrations of electron

acceptors (DO, nitrate, and sulfate) remain relatively depleted in the plume core area, and concentrations of metabolic byproducts (ferrous iron and methane) in the plume area continue to be elevated. Apart from increasing ferrous iron concentrations in some areas, significant increasing or decreasing trends in concentrations of these indicator parameters are not apparent.

Bioplume II model PLATPRD, used to assess the effects of reducing the contaminant source by 20 percent, predicted that the BTEX plume would recede nearly 800 feet by year 2003 (Parsons ES, 1995). The maximum predicted dissolved BTEX concentration in 2003 was 5,300 µg/L. The maximum measured concentration in November 1998 was 3,046 µg/L. However, the well in which the maximum concentration was detected in 1993 (MW-02-014) has not been sampled since. It is conceivable that significant recession of this plume will occur during the next several years given the substantial reduction of the contaminant source that appears to have occurred. However, it should be noted that the Bioplume II model was constructed before the downgradient extent of the BTEX plume was fully defined. Therefore, the model may not have accurately predicted the fate and transport of this plume, and comparison of observed and simulated conditions may not be appropriate.

Similar to BTEX, dissolved CAH concentrations in the source area have decreased substantially over time. Although the CAH plume appears to have expanded toward the southeast since 1993, the available data are insufficient to evaluate current plume dynamics with certainty. CAH plume dynamics are difficult to evaluate due to the irregular or inconsistent sampling of downgradient monitoring locations. In particular, the downgradient extent of the TCE plume (Figure 3) was not defined in 1993, as the furthest downgradient monitoring location (MW-02-043) had an elevated TCE concentration of 373 µg/L. Subsequently, this location was not sampled in 1995 or 1996; but had a significantly elevated TCE concentration of 2,880 µg/L when sampled in November 1998. Therefore, the CAH plume appears to be expanding downgradient, but to what extent cannot be determined.

The presence of anaerobic, reducing conditions throughout most of the plume area, combined with the presence of DCE, VC, and ethene, support the observation that reductive dehalogenation is the dominant biodegradation process working to transform CAHs in groundwater. However, the high concentrations of *cis*-1,2-DCE relative to VC and ethene indicate that the groundwater is not sufficiently reducing to transform the majority of the DCE to less-chlorinated compounds. In addition, the anaerobic conditions that prevail throughout much of the plume indicate that aerobic degradation of DCE and VC is not a major attenuation process at this site.

Additional LTM events should include confirmatory sampling of downgradient well MW-02-043, where 2,880 µg/L of TCE was detected in November 1998. In addition, wells that are located further downgradient and crossgradient should be sampled to assess the extent and migration of this contamination, as well as for other potential sources of CAHs. These location should include, at a minimum, 68PLT21, 69PLT21, 39PLT16, 62PLT20, 63PLT20, 37PLT15, and 38PLT15. In addition, sampling of locations 32PLT12, 33PLT12, 34PLT12, and 35PLT13 along the plume axis will aid in evaluating the evolution of the CAH plume.

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APPENDIX A

1998 ANALYTICAL DATA

MANTECH

Ref: 98/JAD30

Contract # 68-C-98-138

December 10, 1998

Dr. Don Kampbell
National Risk Management Research Laboratory
Subsurface Protection and Remediation Division
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74820

THRU: Dr. Dennis Fine

Dear Don:

As requested in Service Request # SF-0-30, headspace GC/MS analysis of 16 water samples from Plattsburg for chlorinated volatiles was completed. The samples were received on November 23, 1998 and analyzed on December 4-5, 1998. RSKSOP-148 (Determination of Volatile Organic Compounds in Water by Automated Headspace Gas Chromatography/Mass Spectrometry (Saturn II Ion Trap Detector) was used for this analysis.

An internal standard calibration method was established for 15 compounds. The standard curves were prepared from 1.0 to 2000 ppb. The lower calibration limits were 1.0 ppb.

A quantitation report for the samples, lab duplicates, field duplicates, QCs, standards and lab blank is presented in tables 1.

If you should have any questions, please feel free to contact me.

Sincerely,

John Allen Daniel

John Allen Daniel

xc: R.L. Cosby
G.B. Smith
J.L. Seeley

Table I. Quantitative Report for S.R. # SF-0-30 from Plattsburg.

Date received = 11/23/98 | Originator = D. Kampbell | Date analyzed = 12/4-5/98

Concentration ppb

Compound Sample Name:	MW-02005	MW-02-006	MW-02-007	MW-02-075	MW-02-017	MW-02-021	MW-02-022	MW-02-040	MW-02-041	MW-02-41 Field Dup 1/5 Dil
VINYL CHLORIDE	ND	ND	ND	6.4	ND	ND	ND	1.8	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	1.2	7.1	6.3
T-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
C-1,2-DICHLOROETHENE	ND	ND	ND	8.7	1.5	1.2	8.3	695	*****	4230
CHLOROFORM	ND	ND	ND	ND	ND	ND	ND	---	ND	---
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE	ND	ND	ND	ND	24.9	---	4.2	2.6	5.9	5.5
TETRACHLOROETHENE	ND	ND	ND	ND	2.1	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	---	1.8	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	---	ND	ND	---	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	---	ND	---	ND

	MW-02-042	MW-02-042 Lab Dup	MW-02-043	MW-02-43 Field Dup 1/5 Dil	MW-310	MW-3067	MW-7 WOF310	MW44PLT -W1	MW45PLT -W1	QC1204AA.MSQ 20 ppb
VINYL CHLORIDE	20.1	22.0	ND	ND	1130	ND	216	ND	ND	22.2
1,1-DICHLOROETHENE	2.7	3.0	1.1	ND	---	ND	5.0	ND	ND	24.0
T-1,2-DICHLOROETHENE	6.1	6.1	ND	ND	ND	1.2	1.9	ND	ND	20.8
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.9
C-1,2-DICHLOROETHENE	1630	1490	116	110	445	82.3	1460	ND	ND	20.1
CHLOROFORM	---	---	2.6	---	ND	ND	ND	ND	ND	19.2
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.5
CARBON TETRACHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.3
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0
TRICHLOROETHENE	21.7	22.2	*****	2880	---	70.4	19.1	5.6	27.2	19.7
TETRACHLOROETHENE	ND	ND	4.1	---	ND	ND	ND	ND	---	20.8
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	18.7
1,3-DICHLOROBENZENE	ND	ND	ND	ND	---	ND	ND	ND	ND	17.8
1,4-DICHLOROBENZENE	ND	ND	ND	ND	---	ND	ND	ND	ND	18.3
1,2-DICHLOROBENZENE	ND	ND	ND	ND	4.5	ND	ND	ND	ND	18.1

	QC1204B.MSQ 200 ppb	QC1204C.MSQ 20 ppb	QC1204D.MSQ 200 ppb	BL1204A.MSQ
VINYL CHLORIDE	187	22.1	177	ND
1,1-DICHLOROETHENE	214	23.8	212	ND
T-1,2-DICHLOROETHENE	204	21.2	194	ND
1,1-DICHLOROETHANE	225	23.2	220	ND
C-1,2-DICHLOROETHENE	208	19.5	199	ND
CHLOROFORM	209	19.9	193	ND
1,1,1-TRICHLOROETHANE	205	23.3	206	ND
CARBON TETRACHLORIDE	193	22.7	191	ND
1,2-DICHLOROETHANE	226	18.2	216	ND
TRICHLOROETHENE	181	20.2	180	ND
TETRACHLOROETHENE	183	21.2	182	ND
CHLOROBENZENE	205	20.2	200	ND
1,3-DICHLOROBENZENE	186	18.4	180	ND
1,4-DICHLOROBENZENE	188	18.8	189	ND
1,2-DICHLOROBENZENE	205	18.0	199	ND

ND = None Detected --- = Below Calibration Limit(1.0 ppb) ***** = Above Calibration Limit(2000 ppb) QC = Quality Control Std
Dup = Duplicate Dil = Dilution

Ref: 98-MB22
Contract# 68-C-98-138
December 1, 1998

Dr. Don Kampbell
National Risk Management Research Laboratory
Subsurface Protection and Remediation Division
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74820

THRU: Dr. D. Fine

Dear Don:

Please find attached the analytical results for Plattsburgh AFB, Service Request SF-0-30 requesting the analysis of monitoring well samples to be analyzed for MTBE, benzene, toluene, ethylbenzene, p-, m-, and o-xylene, 1,3,5-, 1,2,4-, and 1,2,3-trimethylbenzene, and total fuel carbon. I received your 16 samples November 23, 1998 in capped, lead lined 40 mL VOA vials. The samples were analyzed on November 30, 1998. Samples were stored at 4°C until analyzed. All samples were acquired and processed using the Millennium data system. A 5 point (1-1000 ppb) external calibration curve was used to determine the concentration for all compounds.

RSKSOP-133 "Simultaneous Analysis of Aromatics and Total Fuel Carbon by Dual Column/Dual Detector Gas Chromatography in Ground Water Samples" was used for these analyses. Autosampling was performed using a Dynatech-Precision autosampler in-line with a Tekmar LSC 2000 sample concentrator.

Sincerely,

Mark Blankenship

xc: R.L. Cosby
G.B. Smith
J.L. Seeley

Printed 12/1/98 SF-0-30 Plattsbrgh AFB, NY | Analyses for Dr.Kampbell | Units = ng/ml Analyst M. Blankenship

SAMPLE NAME	MTBE	BENZENE	TOLUENE	ETHYLBENZENE	p-XYLENE	m-XYLENE	o-XYLENE	1,3,5-TMB	1,2,4-TMB	1,2,3-TMB	FUEL CARBON
20 PPB QA\QC	22.1	18.5	19.5	20.7	20.8	21.0	20.0	23.1	22.0	18.1	NA
10 PPB STD	9.3	8.3	9.0	9.7	9.1	9.8	10.3	9.5	9.0	8.6	NA
MW-02-005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02-005 LAB DUPLICATE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02-006	ND	ND	ND	ND	ND	BLQ	ND	ND	ND	ND	ND
MW-02-007	ND	ND	ND	ND	ND	BLQ	ND	ND	ND	ND	ND
MW-02-075	2.1	6.7	41.1	727	616	1330	78.0	45.5	137	64.4	2230
MW-02-017	ND	ND	ND	2.2	2.0	3.7	ND	ND	ND	ND	12.4
MW-02-021	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-02-022	2.5	1.1	ND	ND	ND	ND	ND	ND	ND	ND	71.0
MW-02-040	BLQ	2.7	ND	ND	ND	ND	ND	1.3	ND	ND	95.6
MW-02-041	BLQ	36.3	ND	ND	ND	0.6	ND	4.2	0.9	ND	594
MW-02-042	ND	66.7	ND	ND	ND	ND	ND	ND	ND	ND	82.8
MW-02-043	ND	8.1	ND	ND	ND	ND	ND	ND	ND	ND	571
MW-306	ND	8.0	ND	6.3	ND	ND	ND	ND	ND	ND	48.4
MW-310	2.0	123	222	383	308	422	125	58.9	168	75.5	2810
MW-7FT W-310	BLQ	170	255	577	550	1080	414	202	515	198	6330
MW-44-PLT-W1	ND	ND	ND	BLQ	ND	BLQ	ND	ND	ND	ND	ND
MW-45-PLT-W1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1 PPB STD	1.1	0.9	0.9	0.9	0.9	0.8	1.0	0.9	0.9	0.9	NA

ND = None Detected; BLQ = Below Limit of Quantitation, 1 ppb; NA = Not Analyzed

Analyzed 11/30/98

MANTECH

Ref: 98-AZ31
68-C-98-138

December 3, 1998

Ms. Don Kampbell
National Risk Management Research Laboratory
Subsurface Protection & Remediation Division
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74820

THRU: D. Fine DFine

Dear Don:

As requested in Service Request #SF-0-30, gas analysis was performed for methane, ethylene and ethane on samples received from Plattaburgh AFB. The samples were received on November 23,1998, and analyzed on December 1, 1998. Calculations were done as per RSKSOP-175. Analyses were performed as per RSKSOP-194.

If you have any questions concerning this data, please feel free to contact me.

Sincerely,

Amy Q. Zhao

Amy Q. Zhao

xc: R.L. Cosby
G.B. Smith
J.L. Seeley
G. Sewell

ManTech Environmental Research Services Corporation

R.S. Kerr Environmental Research Center, P.O. Box 1198, 919 Kerr Research Drive
Ada, Oklahoma 74821-1198 580-436-8660 FAX 580-436-8501

Printed 12/03/98 SF-0-30 Originator: D. Kampbell Site: Plattsburgh AFB Analyst: A. Zhao

Samples Received 11/23/98 Samples Analyzed 12/01/98

Sample	Methane ppm (Gas)	Methane ppm mg/L(Water)	Ethylene ppm (Gas)	Ethylene ppm mg/L(Water)	Ethane ppm (Gas)	Ethane ppm (Water)
100 ppm CH4	1.03E+02	~	**	~	**	~
100 ppm C2H4	**	~	1.07E+02	~	**	~
100 ppm C2H6	**	~	**	~	1.05E+02	~
HP. Helium Blank	~	**	~	**	~	**
Lab Blank	~	**	~	**	~	**
MW-02-005	~	**	~	**	~	**
MW-02-006	~	0.090	~	**	~	*
MW-02-007	~	0.108	~	**	~	**
MW-02-017	~	**	~	**	~	**
MW-02-075	~	0.484	~	0.006	~	0.002
MW-02-075 Lab Dup	~	0.467	~	0.006	~	0.002
MW-02-021	~	0.026	~	**	~	**
MW-02-022	~	0.242	~	**	~	**
MW-02-040	~	0.040	~	**	~	**
MW-02-041	~	0.608	~	**	~	0.002
MW-02-042	~	0.799	~	*	~	**
MW-02-042 Field Dup	~	0.814	~	*	~	**
1000 ppm CH4	1.08E+03	~	**	~	**	~
MW-02-043	~	0.002	~	**	~	**
MW-02-044	~	**	~	**	~	**
MW-7' W- of 310	~	0.020	~	*	~	**
MW-02-306	~	0.162	~	**	~	**
MW 310	~	0.467	~	0.363	~	**
MW 310 Lab Dup	~	0.456	~	0.372	~	**
MW -45 PLT W1	~	**	~	**	~	**
MW -45 PLT W1 Field Dup	~	**	~	**	~	**
10 ppm CH4	1.02E+01	~	**	~	**	~
10ppm C2H4	**	~	9.60E+00	~	**	~
10 ppm C2H6	**	~	**	~	9.70E+00	~
Lower Limit of Quantitation	10.0	0.001	10.0	0.003	10.0	0.002

Units for the samples are mg/L dissolved in water.
Units for the standards are parts per million.

~ denotes None Detected.
** denotes Below Limit of Quantitation.
* denotes Not Applicable.

MANTECH

Ref: 98-SH45
Contract # 68-C-98-138

November 30, 1998

Dr. Don Kampbell
National Risk Management Research Laboratory
Subsurface Protection & Remediation Division
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74820

THRU: D.D. Fine

Dear Don:

Attached are TOC results for a set of 16 Plattsburgh samples submitted November 23, 1998 under Service Request #SF-0-30. Sample analysis was begun November 30, 1998 and completed November 30, 1998 using RSKSOP-102.

Blanks, duplicates, AQC samples were analyzed along with your samples, as appropriate, for quality control. If you have any questions concerning this data, please feel free to ask me.

Sincerely,

Sharon Hightower

Sharon Hightower

xc: R.L. Cosby
G.B. Smith
J.L. Seeley

KAMPBELL PLATTSBURGH LIQUIDS SF-0-30
Received 11/23/98
Analyzed 11/30/98 by Sharon Hightower

SAMPLE	% TOC
MW-02-005	1.26
MW-02-006	.624
MW-02-007	1.11
MW-02-017	2.42
MW-02-021	3.05
MW-02-022	4.05
MW-02-040	1.80
MW-02-041	9.44
MW-02-042	4.66
MW-02-043	4.28
DUP	4.33
MW-02-075	4.51
WP39	69.8
MW-7	6.59
MW-44	1.12
MW-45	.760
MW-306	1.50
MW-310	12.7
5 MG/L	4.40

WP39 std. t.v.=76.0 +/-7.60

December 9, 1998
Ref: 98-LP55/lp
98-RJK7/lp
Contract # 68-C-98-138

Dr. Don Kampbell
National Risk Management Research Laboratory
Subsurface Protection & Remediation Division
U.S. Environmental Protection Agency
P.O. Box 1198
Ada, OK 74821-1198

THRU: D.D. Fine

Dear Don:

Attached are inorganic results for a set of 16 samples from Plattsburgh AFB, NY, submitted to MERSC under Service Request # SF-0-30. The samples were received November 23 and were analyzed November 24, 1998. The methods used for these samples were Lachat FIA methods 10-107-06-1-A for ammonia and 10-107-04-2-A for nitrate + nitrite and Waters capillary electrophoresis method N-601 for chloride and sulfate.

Quality assurance measures performed on this set of samples included spikes, duplicates, known AQC samples and blanks.

If you have any questions concerning this data, please feel free to contact me.

Sincerely,

Lynda Pennington

Lynda Pennington

Robert J. Kinsey

xc: R.L. Cosby
J.L. Seeley
G.B. Smith

ManTech Environmental Research Services Corporation

R.S. Kerr Environmental Research Center, P.O. Box 1198, 919 Kerr Research Drive
Ada, Oklahoma 74821-1198 580-436-8660 FAX 580-436-8501

Plattsburgh AFB, NY
Don Kampbell
S.R. # SF-0-30

Rec'd 11-23-98
Analyzed 11-24-98

R.J. Kinsey: NO2+NO3, NH3
L. Pennington: Cl, SO4

SAMPLE	$NO_2^-+NO_3^-$ (N) (mg/L)	NH_3 (N) (mg/L)	Cl^- (mg/L)	SO_4^{-2} (mg/L)
MW-02-005	<0.10	<0.10	38.7	17.1
MW-02-006	<0.10	0.13	115	23.7
MW-02-007	<0.10	0.26	11.9	7.62
MW-02-075	(<0.10) (<0.10)	(0.72) (0.71)	107	19.6
MW-02-017	1.27	<0.10	14.0	13.3
MW-02-021	1.02	<0.10	(8.96) (8.62)	(17.4) (17.0)
MW-02-022	<0.10	<0.10	19.6	15.3
MW-02-040	163	0.13	6.04	6.24
MW-02-041	0.53	<0.10	13.4	0.85
MW-02-042	<0.10	0.14	11.8	<0.50
MW-02-043	12.8	<0.10	2.75	15.2
MW-310	<0.10	2.49	78.4	<0.50
MW-306?	<0.10	0.17	52.4	14.9
MW-7' W of 310	<0.10	1.19	(7.14) (7.09)	(<0.50) (<0.50)
MW-44-PLT-W1	<0.10	<0.10	114	20.7
MW-45-PLT-W1	0.63	<0.10	71.6	17.8
Blank	(<0.10) (<0.10)	(<0.10) (<0.10)	<0.50	<0.50
WPO39	1.04	0.83	10.7	59.3
WPO39 T.V.	1.10	0.84	10.8	58.0
Check Std.	5.10	5.10	4.99	5.04
Check Std. T.V.	5.00	5.00	5.00	5.00
Spike Recovery	106%	106%	102%	100%

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ROBERT S. KERR
ENVIRONMENTAL
RESEARCH LABORATORY
ADA, OKLAHOMA

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

SOURCE Plattsburgh AFB DATE 11/17/98

ANALYSIS _____ GROUP FT-002 ANALYST Park

SAMPLE	TIME	Alkalinity mg/L	Fe++ mg/L	Sulfide mg/L	pH +,S SU			
MW-02-040	1130	160	<.1	<.1	6.1			
MW-02-041	1225	260	<.1	<.1	6.1			
MW-02-042	1200	160	0.5	<.1	6.1			
MW-02-007	1540	80	0.2	<.1	5.8			
MW-02-006	1650	180	3.0	0.5	5.8			
MW-02-075	1700	140	7.0	0.2	5.9			
11/18/98 MW-02-021	1030	200	0.2	<.1	6.0			
MW-02-022	1100	220	0.7	<.1	5.9			
MW307 or 02-017	1145	180	<.1	<.1	6.4			
MW-7'W of 310	1700	240	15.0	<.1	6.0			
MW306? or 7'N of 310	1420	100	<.1	<.1	5.8			
MW 310	1440	220	12.0	<.1	5.9			
MW02-043	1545	160	0.2	<.1	5.9			
11/19/98 44PLTW1	0900	140	0.6	<.1	6.0			
45PLTW1	0925	200	<.1	<.1	6.5			
MW02-005 (MW105)	1015	140	0.6	<.1	5.9			
MW02-014	Collected floating product only							

REMARKS _____

Groundwater Sampling Record

Monitoring Well No. MW02-005 on ~~MW105~~

11/19/98

Plattsburgh AFB

5[ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: Teflon bailer
[ ] Pump, type:
[ ] Other, describe:

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6[ ] ON-SITE MEASUREMENTS:

Time	1010	1015				Measured with
Temp (°C)	9.9	9.9				
pH						
Cond (µS/cm)	426	428				
DO (mg/L)	1.0	0.9				
Redox (±V)	-104	-110				
Salinity						

7[ ] SAMPLE CONTAINERS (material, number, size):

Check-off

1[ ] EQUIPMENT CLEANED BEFORE USE WITH:
Items Cleaned (List):

2[ ] ~~PRODUCT~~ Well DEPTH: 48' FT. BELOW DATUM
Measured with:

WATER DEPTH: 30.6' TOC FT. BELOW DATUM
Measured with:

3[ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: dissolved peat color
Turbidity:
Odor:
Other Comments:

4[ ] WELL EVACUATION:
Method:
Volume Removed:
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors:
Other comments:

Groundwater Sampling Record

Monitoring Well No: WW-02-006

SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: EnviroTech
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	1550	1555				Measured with
Temp (°C)	10.9	10.9				
pH						
Cond (µS/cm)		788				
DO (mg/L)	1.5	0.5				
Redox (mV)	-143	-160				
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] ~~PRODUCT~~ Well DEPTH: 41' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 28.9 TOC FT. BELOW DATUM
Measured with: _____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

X

Groundwater Sampling Record

Monitoring Well No. MW-22-007 11/17/98

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Envirotech
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	1520	1530				Measured with
Temp (°C)	8.4	8.4				
pH						
Cond (µS/cm)	243	244				
DO (mg/L)	0.3	0.3				
Redox (±V)	-72	-84				
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] PRODUCT DEPTH: 76' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 28.6 TOC FT. BELOW DATUM
Measured with: _____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. MW-307-1 (MW-02-017) 11/18/98 Plattsburgh AFB

5[ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Enviroteck - Submersible pump
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6[ ] ON-SITE MEASUREMENTS:

Time	12:01 pm					Measured with
Temp (°C)	9.1					
pH						
Cond (µS/cm)	398					
DO (mg/L)	7.5					
Redox (±V)	+143.7					
Salinity						

pH 6.4
ALK. 9 drops = 180 mg/l
IRON 0.0
H_2S 0.0

7[ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1[ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2[ ] PRODUCT DEPTH: _____ FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 29.7' TOC FT. BELOW DATUM
Measured with: _____

3[ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4[ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. MW02-075 11/17/98

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of:_____
[ ] Pump, type: ENVIROTECH
[ ] Other, describe:_____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	1640	1645			Measured with
Temp (°C)	9.3	9.2			
pH					
Cond (µS/cm)	774	765			
DO (mg/L)	0.3	0.3			
Redox (mV)	-120	-117			
Salinity					

7 [ ] SAMPLE CONTAINERS (material, number, size):_____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH:_____
Items Cleaned (List):_____

2 [ ] ~~PRODUCT~~ well DEPTH: 42' FT. BELOW DATUM
Measured with:_____

WATER DEPTH: 29.2' TOC FT. BELOW DATUM
Measured with:_____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color:_____
Turbidity:_____
Odor: Yes - fuel
Other Comments:_____

4 [ ] WELL EVACUATION:
Method:_____
Volume Removed:_____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors:_____
Other comments:_____

Groundwater Sampling Record

11/18/98

Monitoring Well No. MW-02-021

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Masterflex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	1005	1012	1017			Measured with
Temp (°C)	10.4	10.4	10.1			
pH						
Cond (µS/cm)	507	505	504			
DO (mg/L)	0.3	0.2	0.2			
Redox (mV)	+61	+41	+40			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] ~~PRODUCT~~ Well DEPTH: 19.5' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 4.2' TOC FT. BELOW DATUM
Measured with: Solinst

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. MW02-022 11/18/98

5[ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Masterflex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6[ ] ON-SITE MEASUREMENTS:

Time	1045	1050	1055			Measured with
Temp (°C)	10.3	10.3	10.4			
pH						
Cond (µS/cm)	592	595	596			
DO (mg/L)	0.3	0.1	0.1			
Redox (mV)	-65	-77	-81			
Salinity						

7[ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1[ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2[ ] well ~~PRODUCT~~ DEPTH: 32' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 4.2' TOC FT. BELOW DATUM
Measured with: _____

3[ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4[ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Plattsburgh AFB

Monitoring Well No. MW-02-040 11/17/98

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Master flex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	1150	1156	1202			Measured with
Temp (°C)	9.6	9.6	9.6			
pH						
Cond (µS/cm)	768	774	778			
DO (mg/L)	0.4	0.1	0.1			
Redox (mV)	+200	+191	+182			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

well
2 [ ] ~~PRODUCT~~ DEPTH: 29' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 8.65' ft FT. BELOW DATUM
Measured with: _____

3 [ ] WATER CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: 4 gal
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well MW-02-041 11/17/98

5[ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Masterflex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6[ ] ON-SITE MEASUREMENTS:

Time	1315	1320	1325			Measured with
Temp (°C)	9.6	9.7	9.6			
pH						
Cond (µS/cm)	664	664	664			
DO (mg/L)	0.1	0.1	0.1			
Redox (±V)	+58	+49	+44			
Salinity						

7[ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1[ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2[ ] ~~PRODUCT~~ Well DEPTH: 42.1 FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 7.95 FT. BELOW DATUM
Measured with: _____

3[ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4[ ] WELL EVACUATION:
Method: _____
Volume Removed: 6 gal
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. MW-02-042

11/17/98

5[ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Master flex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6[ ] ON-SITE MEASUREMENTS:

Time	1245	1250	1256			Measured with
Temp (°C)	10.1	10.0	10.0			
pH						
Cond (µS/cm)	385	386	386			
DO (mg/L)	0.2	0.1	0.1			
Redox (±V)	-21	-33	-38			
Salinity						

7[ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1[ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2[ ] ~~PRODUCT~~ Well DEPTH: 63' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 7.22' TOC FT. BELOW DATUM
Measured with: _____

3[ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4[ ] WELL EVACUATION:
Method: _____
Volume Removed: 7 gal
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

[ ] Other, describe:_____ MW2-043

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

-043

6 [ ] ON-SITE MEASUREMENTS:

Time	1635	1640	1645			Measured with
Temp (°C)	10.3	10.2	10.2			
pH						
Cond (µS/cm)	676	670	655			
DO (mg/L)	0.3	0.1	0.1			
Redox (±V)	+103	+122	+123			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size):_____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH:_____

Items Cleaned (List):_____

2 [ ] ~~PROBE~~ Water DEPTH: 2.9' TOC FT. BELOW DATUM

Measured with: Geoprobe

~~WATER~~ well DEPTH: 25' FT. BELOW DATUM

Measured with:_____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):

Color:_____

Turbidity:_____

Odor:_____

Other Comments:_____

4 [ ] WELL EVACUATION:

Method:_____

Volume Removed:_____

Observations: Turbidity (clear slightly cloudy very cloudy)

Water level (rose fell no change)

Water odors:_____

Other comments:_____

DEPTH INTERVAL

Groundwater Sampling Record

11/19/98

Monitoring Well No. 44PLTW1-? no well marking

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Master flex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	0950	0955	1000			Measured with
Temp (°C)	9.6	9.7	9.7			
pH						
Cond (µS/cm)	692	695	699			
DO (mg/L)	0.3	0.2	0.1			
Redox (mV)	-83	-103	-108			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] ~~PRODUCT~~ well DEPTH: 39' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 6.2' TOC one inch PVC well FT. BELOW DATUM
Measured with: Geoprobe

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. 45PLTW1 – no well marking

11/19/98

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Master Flex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	0910	0915	0920			Measured with
Temp (°C)	11.4	11.4	11.4			
pH						
Cond (µS/cm)	683	684	685			
DO (mg/L)	8.4	8.3	8.3			
Redox (±V)	+177	+185	+191			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] ~~PRODUCT~~ well DEPTH: 24' one inch pvc FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 6.1' Toc FT. BELOW DATUM
Measured with: _____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

11/18198

Groundwater Sampling Record

Monitoring Well No. MW 310

5 [ ] SAMPLE EXTRACTION METHOD:

[ ] Bailer made of: _____
[ ] Pump, type: Masterflex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	3:23 pm	3:28 pm	3:33 pm			Measured with
Temp (°C)	9.8	9.8	9.8			
pH						
Cond (µS/cm)	741	740	741			
DO (mg/L)	0.0	0.0	0.0			
Redox (mV)	-102.7	-105.2	-105.2			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] ~~PRODUCT~~ well DEPTH: 41' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 10.5' TOC FT. BELOW DATUM
Measured with: Geoprobe

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: _____
Turbidity: _____
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: _____
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. MW306? North of 310

5 [ ] SAMPLE EXTRACTION METHOD: 306

[ ] Bailer made of: _____
[X] Pump, type: Peristaltic "Master-Flex"
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	2:49 PM	2:54 PM	2:59 PM			Measured with
Temp (°C)	9.5	9.5	9.5			
pH						
Cond (µS/cm)	411	407	408			
DO (mg/L)	0.3	0.2	0.2			
Redox (mV)	-127.2	-134.5	-135.2			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

well

2 [ ] ~~PRODUCT~~ DEPTH: 56' TOC FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 9.9' TOC FT. BELOW DATUM
Measured with: _____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: clr
Turbidity: none
Odor: none
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: 10 Gallons
Observations: Turbidity (clear slightly cloudy very cloudy)
Water level (rose fell no change)
Water odors: _____
Other comments: _____

Groundwater Sampling Record

Monitoring Well No. West of MW 310

5 [ ] SAMPLE EXTRACTION METHOD: MW-7 N. of 310

[ ] Bailer made of: _____
[ ] Pump, type: Master flex
[ ] Other, describe: _____

Sample obtained is [X] GRAB; [ ] COMPOSITE SAMPLE

6 [ ] ON-SITE MEASUREMENTS:

Time	2.17 PM	2.25PM	2:30 PM			Measured with
Temp (°C)	10.3	9.9	10.0			
pH						
Cond (uS/cm)	559	558	555			
DO (mg/L)	0.1	0.2	0.0			
Redox (mV)	-121.9	-129.5	-126.1			
Salinity						

7 [ ] SAMPLE CONTAINERS (material, number, size): _____

Check-off

1 [ ] EQUIPMENT CLEANED BEFORE USE WITH: _____
Items Cleaned (List): _____

2 [ ] ~~PRODUCT~~ Well DEPTH: 26' FT. BELOW DATUM
Measured with: _____

WATER DEPTH: 11.5' TOC FT. BELOW DATUM
Measured with: _____

3 [ ] WATER-CONDITION BEFORE WELL EVACUATION (Describe):
Color: Dark Brown
Turbidity: moderate
Odor: _____
Other Comments: _____

4 [ ] WELL EVACUATION:
Method: _____
Volume Removed: 5 gallons
Observations: Turbidity (clear slightly cloudy (very cloudy))
Water level (rose fell no change)
Water odors: _____
Other comments: _____